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-	19	(6175343.pn. or 6119932.pn. or 6112206.pn. or 6019725.pn. or 6014184.pn. or 5986650.pn. or 5969704.pn. or 5822123.pn. or 5797849.pn. or 5790177.pn. or 5781246.pn. or 5767913.pn. or 5671436.pn. or 5629733.pn. or 5589892.pn. or 5585866.pn. or 5508733.pn. or 5222134.pn. or 5103476.pn.) and (time near (superpose or superimpose or overlay))	USPAT; US-PGPUB	2004/02/27 15:52
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US005552989A

United States Patent [19]

Bertrand

[11] **Patent Number: 5,552,989**

[45] **Date of Patent: Sep. 3, 1996**

[54] **PORTABLE DIGITAL MAP READER**

[76] Inventor: **Georges Bertrand**, 35, rue du Bois-des-Joncs-Marins, 94120 Fontenay-sous-Bois, France

[21] Appl. No.: **211,924**

[22] PCT Filed: **Oct. 27, 1992**

[86] PCT No.: **PCT/FR92/01002**

§ 371 Date: **Apr. 28, 1994**

§ 102(e) Date: **Apr. 28, 1994**

[87] PCT Pub. No.: **WO93/09401**

PCT Pub. Date: **May 13, 1993**

[30] **Foreign Application Priority Data**

Oct. 30, 1991 [FR] France 91 13345

[51] **Int. Cl.**[6] **G06F 165/00**

[52] **U.S. Cl.** **364/443**; 364/449; 340/990; 340/995

[58] **Field of Search** ..... 364/443, 444, 364/449; 73/178 R; 340/988, 990, 995

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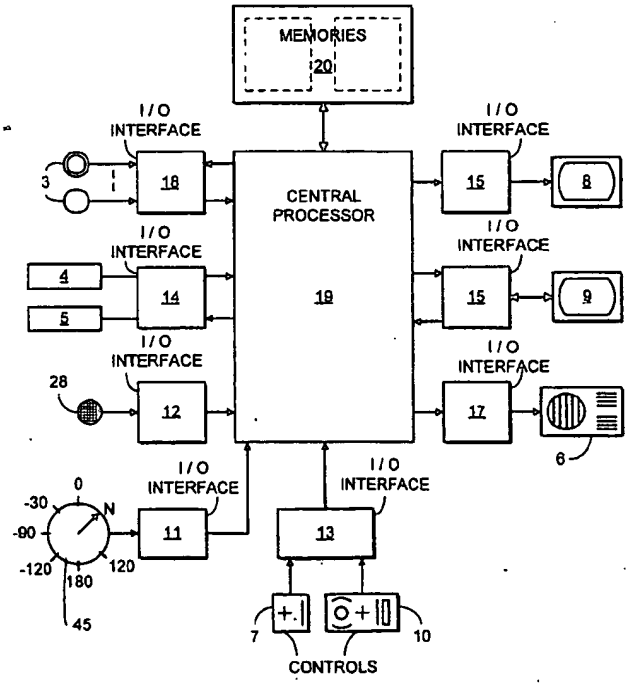
Primary Examiner—Gary Chin
Attorney, Agent, or Firm—Ladas & Parry

[57] **ABSTRACT**

The invention relates to an appliance for reading digital geographical maps, in particular topographical or road maps, recorded on magnetic or optical media, the appliance comprising in conventional manner a central processor unit (**19**), means (**4, 5**) for reading magnetic or optical media, at least one display screen (**8, 9**), control means (**7, 10**), and electrical power supply means. It includes a compass (**45**) adapted to measure the angle between the orientation of the appliance and magnetic north, and to send corresponding information to the central unit (**19**), said central unit responding to said information by issuing a corresponding order to the screen display process to cause the displayed image to be oriented as a function of said information. The appliance is designed to replace a conventional paper map, together with guidebooks, diaries, and directories.

8 Claims, 7 Drawing Sheets



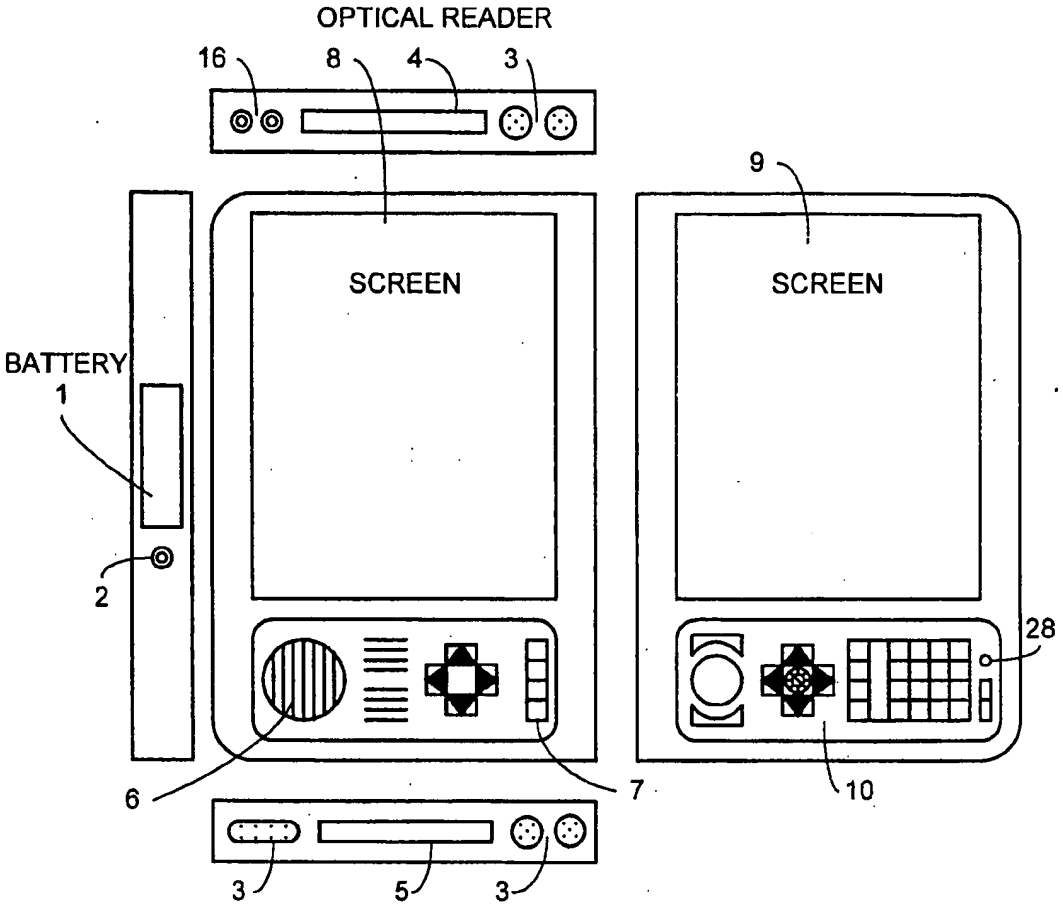
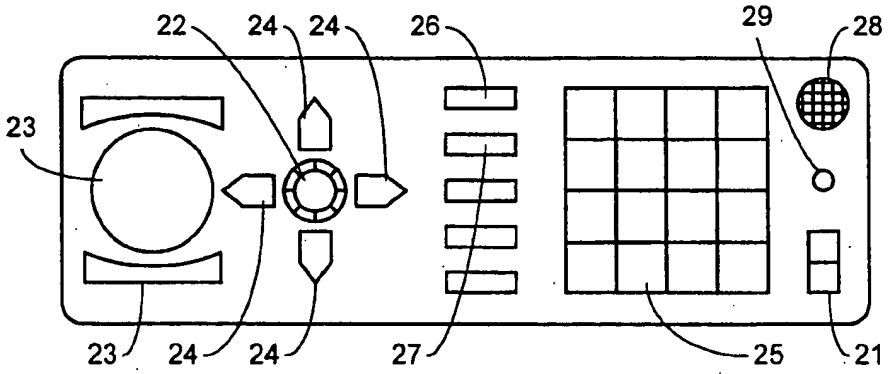

OPTICAL READER
16
8
4
3
9
SCREEN
SCREEN
BATTERY
1
2
28
6
7
10
3
5
3

FIG. 1


22
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24
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29
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23
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24
27
25
21

FIG. 2

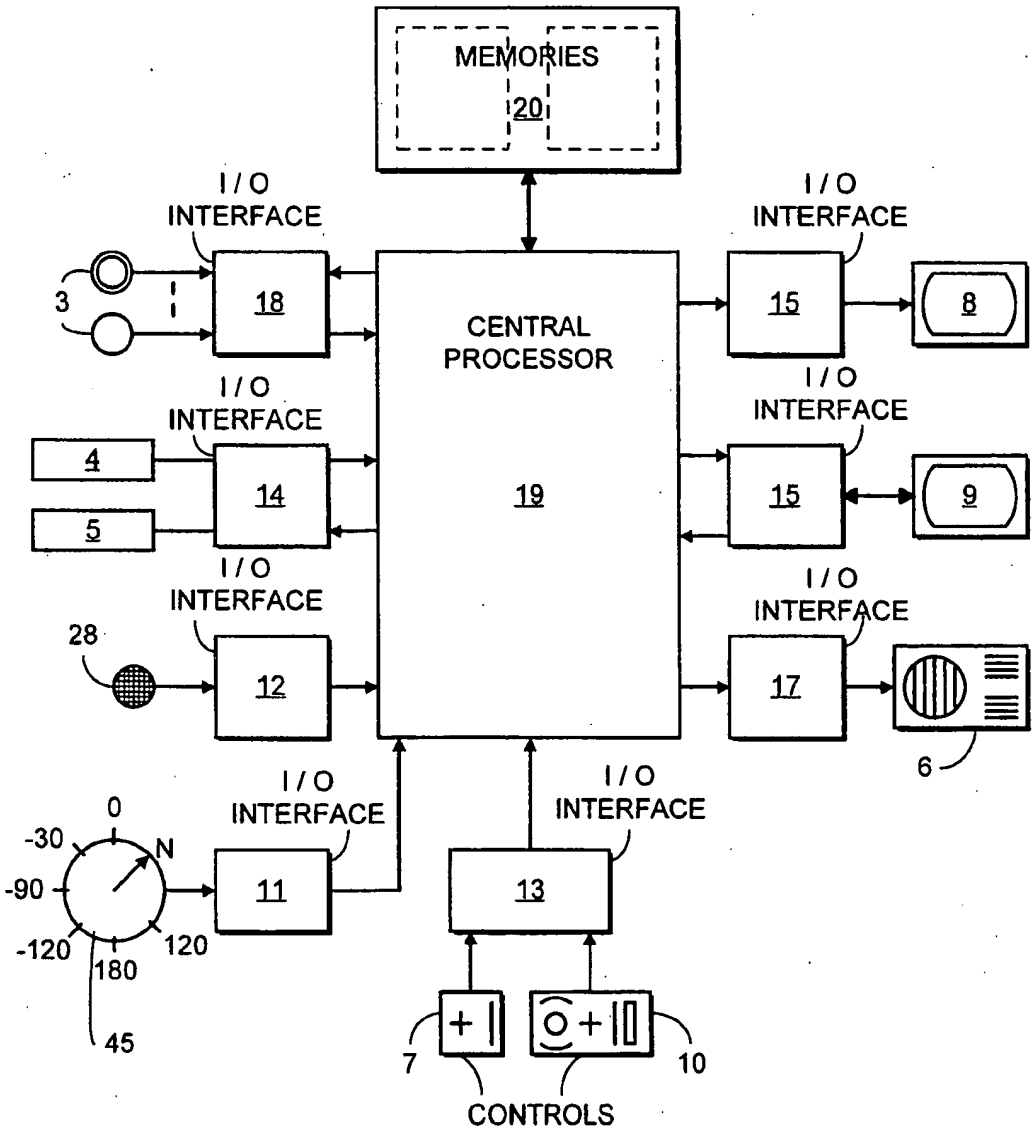

MEMORIES
20
I/O INTERFACE
18
3
CENTRAL PROCESSOR
19
I/O INTERFACE
15
8
I/O INTERFACE
4
5
14
I/O INTERFACE
15
9
I/O INTERFACE
28
12
I/O INTERFACE
17
6
I/O INTERFACE
11
0
-30
N
-90
-120
120
180
45
I/O INTERFACE
13
7
10
CONTROLS

FIG. 3

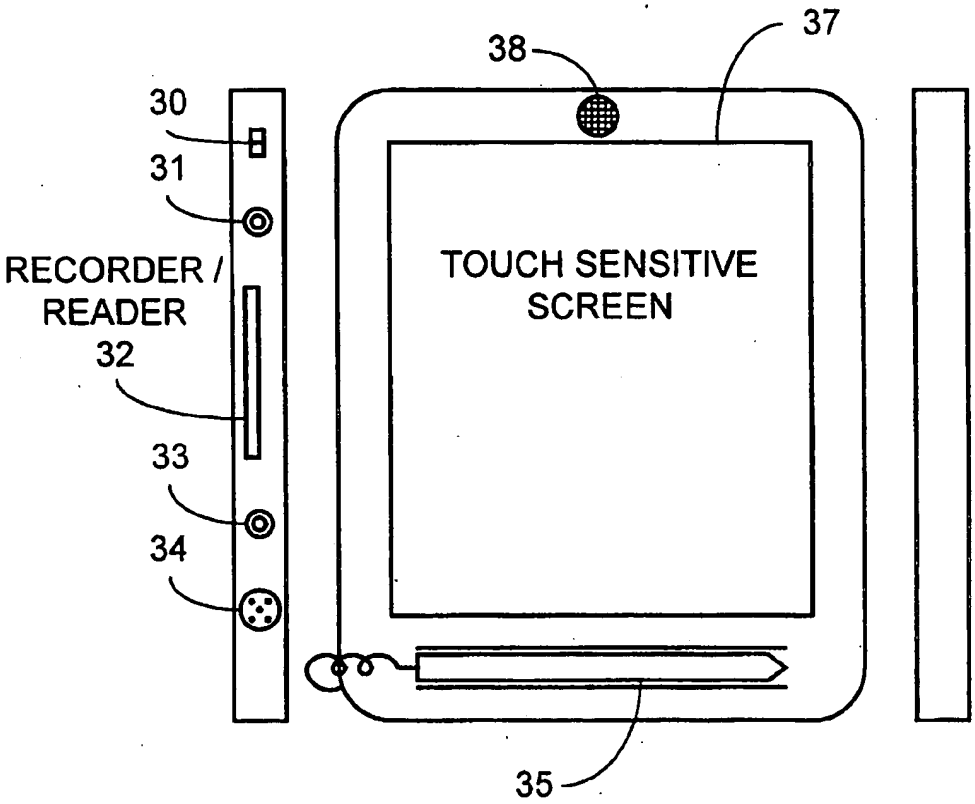

38
37
30
31
RECORDER / READER
32
33
34
TOUCH SENSITIVE SCREEN
35

FIG. 4

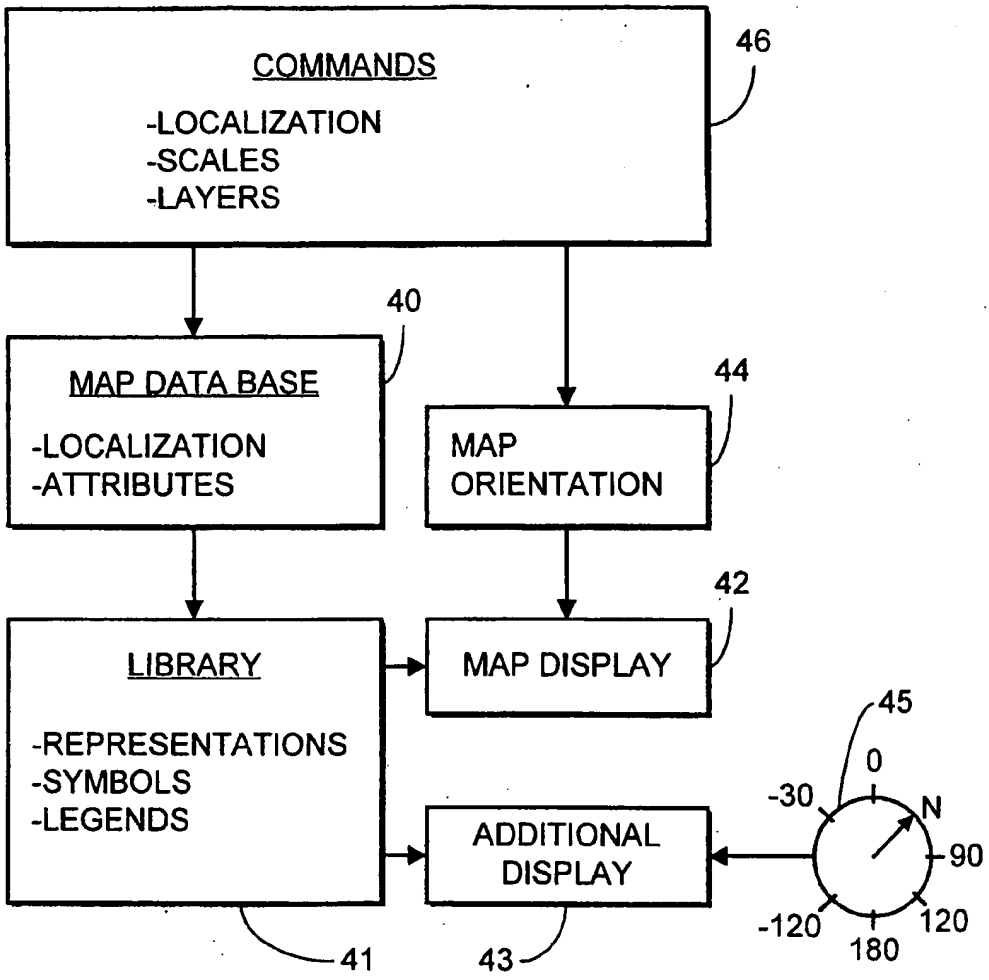

COMMANDS
-LOCALIZATION
-SCALES
-LAYERS
46
40
MAP DATA BASE
-LOCALIZATION
-ATTRIBUTES
44
MAP
ORIENTATION
42
LIBRARY
-REPRESENTATIONS
-SYMBOLS
-LEGENDS
MAP DISPLAY
45
0
-30
N
90
ADDITIONAL
DISPLAY
-120
120
180
41
43

FIG. 5

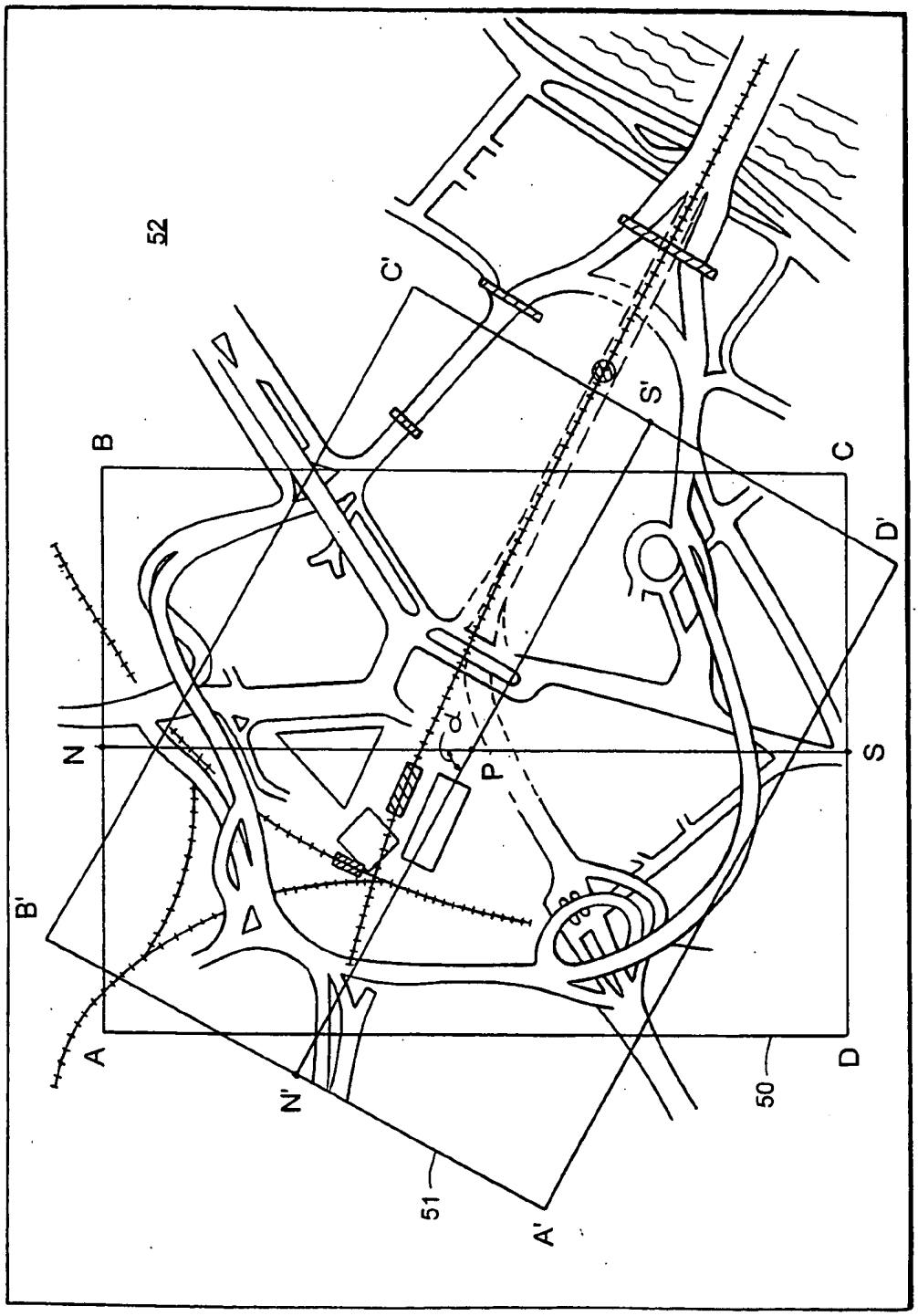
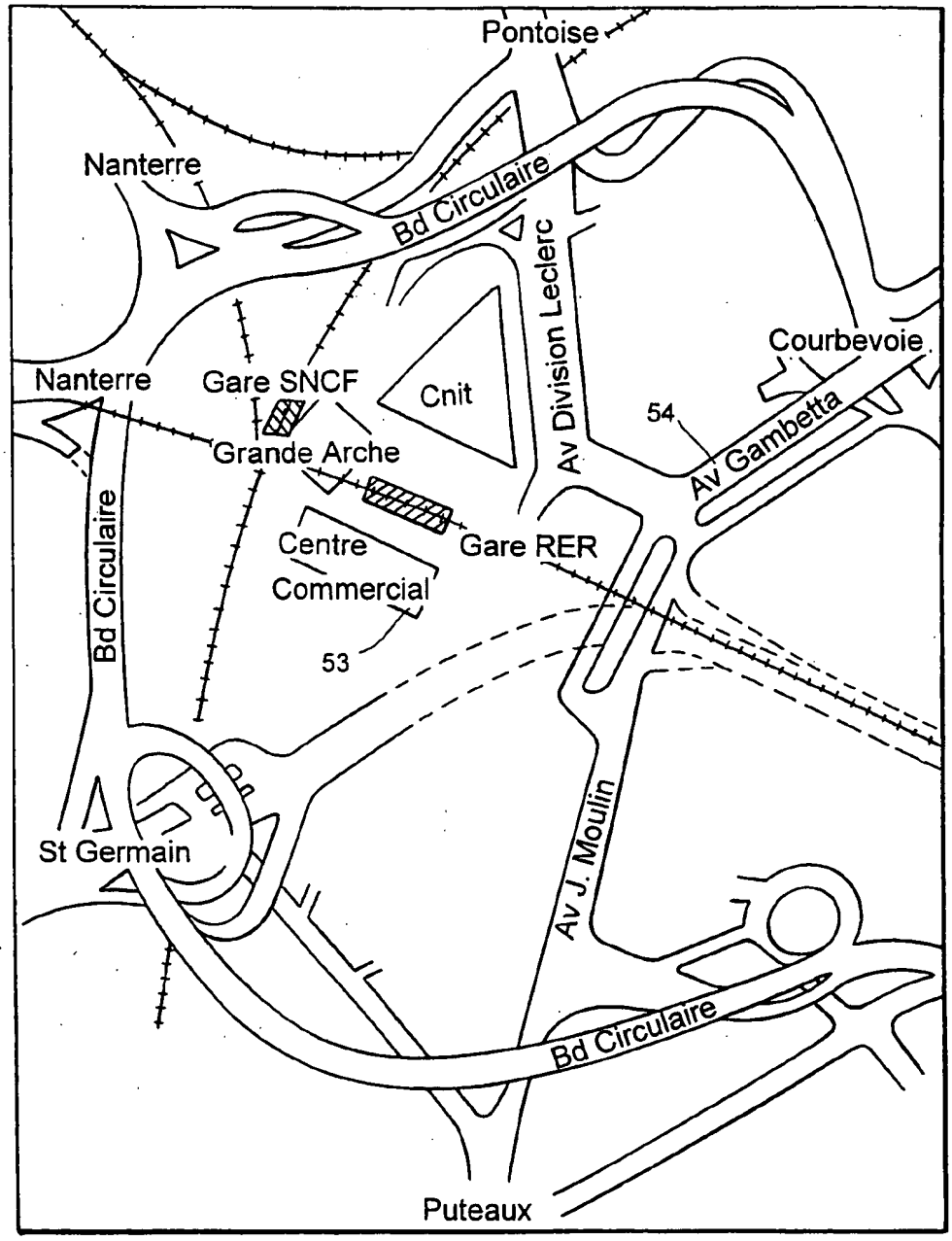


FIG. 6

FIG. 7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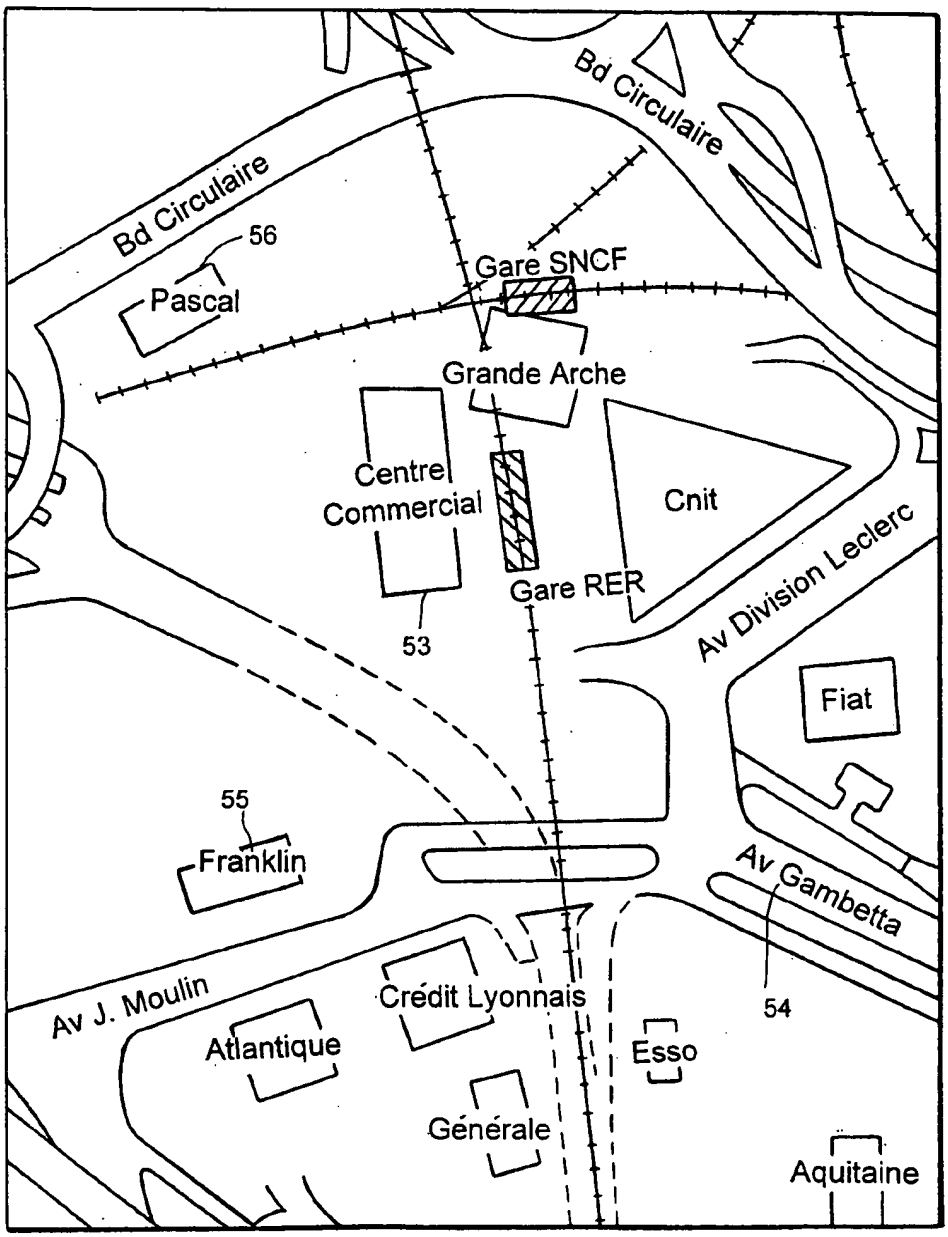
Puteaux

FIG. 8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Cnit
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Franklin
Av Gambetta
Av J. Moulin
Crédit Lyonnais
54
Atlantique
Esso
Générale
Aquitaine

PORTABLE DIGITAL MAP READER

BACKGROUND OF THE INVENTION

The present invention relates to a lightweight and self-contained appliance enabling digital maps to be read and enabling local information to be associated therewith, in particular to replace paper guidebooks, and paper geographical maps, topographical maps or road maps.

Paper maps suffer from numerous drawbacks and limitations, and in particular:

- they are unhandy (map size does not make for ease of manipulation);
- they are fragile (because they are handled so much);
- they are discontinuous (several maps are necessary to cover a given territory);
- they are of limited information capacity (a map with too much detail is unreadable) thus making it impossible, in particular, to gain access to additional local information (a map needs to be used in association with a guidebook);
- they cannot be updated (an out-of-date paper map must be discarded); and
- scale is fixed (to change scale it is necessary to change map).

Systems for navigation and for providing assistance in car driving are known that calculate the position of a vehicle relative to a digital road map background. However, such systems are typically complex, e.g. relying on special road infrastructure, or they are expensive, and not self-contained, thus corresponding to a limited part of the use to which a geographical map or town plan on paper can be put.

SUMMARY OF THE INVENTION

In contrast, the present invention seeks to provide self-contained apparatus that is easy to use and cheap, and that enables digital road maps or geographical maps to be consulted in any location, such consultation being facilitated by the orientation of the displayed map being constant, as a function of user displacement.

Another object of the invention is to enable all kinds of display processing to be performed: updating, printing, storage, and topographical calculation, all of which are at present impossible using a map on paper.

These objects are achieved by an appliance for reading digital geographical maps, in particular topographical or road maps, recorded on magnetic or optical media, the appliance comprising in conventional manner a central processor unit, means for reading magnetic or optical media, at least one display screen, control means, and electrical power supply means, the appliance being characterized in that it further includes a compass adapted to measure the angle between the orientation of the appliance and magnetic north, and to send corresponding information to the central unit, said central unit responding to said information by issuing a corresponding order to the screen display process to cause the displayed image to be oriented as a function of said information.

This orientation of the map thus enables users to position themselves automatically in three dimensions and observe the topography of the places in front of them without any risk of confusion on the display screen when the apparatus is held in the hand in front of them.

Advantageously, it includes two display screens suitable respectively for displaying a portion of a digital map, and for any other information such as a map, text, a picture, or an icon.

It is thus possible to associate certain places displayed on the first screen with multimedia information (sound, text, images) visible on the second screen and of use to a walker, a tourist (display and description of a view, of sites, of monuments, providing a list of hotels, of restaurants, of facilities, etc. . . .), to a professional (addresses, resources, etc. . . .), or to a visitor (exhibitions, museums, etc. . . .).

Advantageously, the device of the invention is powered in self-contained manner by batteries that are rechargeable or otherwise, and it is portable. On-board a vehicle, the power supply may be obtained directly from the vehicle battery.

Preferably, it includes means enabling local multimedia information to be recorded and played back, together with means enabling a planned or a performed itinerary to be recorded and displayed, in particular with its characteristic times, distances, and changes in altitude.

In a professional version, it may include means for displaying and recording information of any kind on the described map and in association with a directory or a diary.

BRIEF DESCRIPTION OF THE DRAWINGS

Other characteristics and advantages of the present invention appear more clearly on reading the following description which is made with reference to the accompanying drawings, in which:

FIG. **1** shows an embodiment of a two-screen reader for digital road or topographical or geographical maps;

FIG. **2** shows an embodiment of the controls for the FIG. **1** reader;

FIG. **3** shows the internal structure of a reader of the invention;

FIG. **4** shows a variant embodiment of a digital map reader that has only one screen;

FIG. **5** is a simplified block diagram showing the functional organization of the device of the invention;

FIG. **6** shows at identical scale the effect of rotating the displayed map through an angle a due to the device itself being rotated;

FIG. **7** is a first example of one of the displays possible on the display screen; and

FIG. **8** shows a second example of a display after the device has been rotated and after a change of scale.

DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

FIG. **1** shows a two-screen digital map reader of the invention made up of two portions each having its own screen, which portions may be separated and assembled together by snap-fastening. The lefthand portion contains a battery **1**, an electrical power supply circuit **2**, a plurality of input/output connectors and sockets, in particular for an audio headset **16**, an optical reader **4**, a magnetic recorder and reader **5**, a loudspeaker **6**, a control keypad **7**, and a flat screen **8**. The righthand portion includes a screen **9** that is advantageously touch-sensitive, and a set of controls **10** provided, in particular, with a microphone **28**. In the closed position, the righthand portion overlies the lefthand portion.

FIG. **2** shows the set of controls of FIG. **1** in greater detail.

It comprises:

an on/off switch **21** with an associated indicator lamp **29**;

a zoom control (change of scale) by means of a knob, keys, a cursor, or any other device **22**;

a cursor-moving ball (a trackball) or any other device **23** enabling a cursor to be positioned and actuated on the screen;

keys **24** for screen scrolling, these keys may be replaced by a joystick or by any other appropriate device;

a digital keypad **25** enabling digits or codes to be input;

a memory key **26**; and

programmable function keys **27**, and the microphone **28**.

A keyboard may also be provided for professional applications (for managing diary, directory, etc. functions).

The internal structure of the device of the invention is described with reference to FIG. **3**. This structure is organized around a central processor unit **19** and associated memories **20** (data memory and program memory) in a conventional microprocessor configuration. Special interfaces provide a connection with the various elements of the device: a measurement interface **28** for controlling a compass **45**, two screen interfaces **15** for controlling the display screens **8** and **9**, a keypad interface **13** for controlling the keypad and the set of controls **7**, **8**, a loudspeaker interface **17** for controlling the loudspeaker **6**, a microphone interface **12** for controlling the microphone input **11**, a reader interface **14** for controlling the digital or analog readers **4** and **5**, and an input/output interface **18** for connection with the various external connectors and sockets **3**.

The device is made self-contained by means of a self-contained electrical power supply (not shown) that may be constituted by a rechargeable battery advantageously provided with means for protecting its level of charge. To enable the device to be used in any location, a 12 V socket may also be provided for connection in a motor vehicle, as may a mains socket for connection at home or in the office.

All of the commands are available via the trackball (or the substitute therefor) by clicking on icons (menu bars, scroll arrows, position markers, etc. . . .). Direct access to such icons may be obtained from the touch-sensitive screen **9** when available. The microphone **28** can be used for recording voice commands or sounds to be stored.

The memories **20** comprise in particular mass memory for storing digital multimedia or cartographic information (or analog information), programs, and information that is waiting to be printed out. These storage members may be of any kind (magnetic, optical, optomagnetic, etc. . . .) and of any format (maps, floppy disks, hard disks, etc.).

The input/output connectors and sockets serve, in addition to the connections mentioned above, for providing connections with peripherals (a printer, a plotter, an external screen, a television set, a scanner, a digital camera, a video camera, etc. . . .), with networks, with other computers, or indeed with other digital map readers.

The central processor unit **19** comprises, in particular, one or more processors (for calculation, optimization, topological simulation, compression, etc. . . .), together with a time base enabling date and time to be displayed and enabling travel times to be computed. It cooperates with the compass **45** that makes it possible to measure the angle between the orientation of the appliance and magnetic north.

This structure makes it possible, using an appliance that is self-contained and portable, to perform a wide variety of map functions, including, for example: display; scrolling (to left, to right, etc.); zooming (change of scale); calculating routes (including calculating distances, times, changes of altitude, etc. analysis (displaying various themes: geological data or hydrological data, for example); printing out routes as calculated and including the main difficulties therein (cross-roads, forks, etc. . . .); recording routes that have been followed and the times associated therewith; and recording texts, sounds, and images associated with a particular location. Similarly, special functions may be developed for use by certain categories of user: the professions, businesses, etc. (diary, directory, dictionary, memos, . . .).

FIG. **4** shows an example of a single-screen embodiment. This device comprises an on/off switch **30**, a 12 V input **31**, a recorder-reader **32**, a headset socket **33**, an input/output connector **34**, a light pen **35** for activating a touch-sensitive screen **37**, and a microphone **38**. In this embodiment, the various functions (guidebook, directory, diary, etc. . . .) are displayed in windows that overlap a portion of the digital map that also appears on the same screen.

A conventional format for the device of the invention may be one of the formats A4 and A5, however any dimensions are possible providing the display is readable and the device is not too heavy for a device that is self-contained and portable.

Operation of the device of the invention is described below with reference to FIGS. **5** to **8**.

The portable digital map reader displays cartographic information and additional information that may appear on one or more screens.

The basic functions of the device (displaying map, guidebooks, optimizing and tracking routes, diary, directory) may be associated with additional functions that are specific to professional or recreational activities.

The very large storage capacity of optical or magnetic systems makes it possible to store a very full amount of information: hotels, restaurants, bars, service stations and garages, police services; medical services, tourist information, or professional information of any kind, train and air timetables, FM frequencies, useful telephone numbers, etc. . . .

The above information is stored together with the cartographic database and can be very detailed in its description of the services available (opening days and times, menus, prices, times of guided tours, programs, etc. . . .); the improvement over maps and guides on paper is overwhelming both with respect to the quantity of information and with respect to the ease and speed of access and of searching (particularly given the dynamic linking that can be achieved between the map and the guidebooks making it possible, for example, to answer the following question: list two-star hotels situated within 10 minutes' walking distance).

To make this possible, the database **40** comprising geographical objects (where an object may be a town, an area, a monument, etc. . . .) is organized in such a manner as to enable firstly display at several scales (zoom) and secondly readability of the legends displayed on the map at any scale (once a single format has been adopted for legends), with this being true regardless of the angle at which the map is displayed. In addition, selecting and combining certain categories of objects are made easier by organization in layers, where any one object may be associated with a plurality of different layers.

One of the ways in which such a database can be organized consists in associating each geographical object with the following two elements:

location data for managing topology (position and shape of the object):

a centroid identified in a coordinate system;

points, segments, polygons, curves, etc. . . .

adjacency, continuity, inclusion, intersection, etc. . . . ; and

attributes identifying and describing the object:

name;

type of object (with reference to a nomenclature);

level numbers (an object may appear at several different levels);

layer numbers (an object may belong to several different layers);

characteristics (size, altitude, type, . . .); and

description and contents of the object.

For object description, attributes may be constituted by texts, still pictures, moving pictures, and/or sounds.

Each object is associated with a graphical representation that may additionally be associated with one or more symbols and with a legend, which set of elements is available in a library **41** that cooperates with the database **40**.

The graphical representation depends on the type of the object, on its position, and where appropriate, on its shape and on its characteristics. Its size varies with scale (zoom) and it follows the orientation **44** as controlled by the compass **45**.

The symbols and the legends are of fixed size and they are displayed horizontally to make them easier to read. Legends associated with segments of a network may be displayed parallel to such segments (see for example reference **54** in FIGS. **7** and **8**).

Symbols are a function of the type of an object, and where appropriate of its characteristics and of the contents of its attributes (presence of a message, of illustrations, of animated sequences, of a sound sequence, . . .). Legends display the name of the object using a typeface, a size, a color, and a style that depend on the type and on the characteristics of the object.

A display control **46** enables the objects that correspond to selected layers to be selected from the database **40** for one or more locations at one or more scales. The representations, symbols, and legends associated with the objects are then taken from the library **41** and displayed **42**, **43** on the corresponding screens (or in the windows associated therewith for a single-screen embodiment). In addition, access to non-displayed information (detail attributes) is possible by moving a cursor onto the corresponding symbol or legend.

FIG. **6** shows the influence of changing orientation of the device on the way in which cartographic data is displayed.

One of the objects of the present device is to make north as displayed on the map coincide with geographic north, regardless of the vertical direction of the display screen. Thus, the device includes a compass **45** as means for measuring the orientation of the portable appliance and for transmitting appropriate display instructions as a function thereof to enable the map to be displayed as a function of said orientation, i.e. to control the display axis of the map.

The compass measures the angle a between magnetic north and the vertical direction of the display screen (using a plus sign to the right and a minus sign to the left).

The geographical database contains values E for the difference between magnetic north and true north on the maps to be displayed. This value may be a constant for a country or a group of countries.

The angle of rotation of the map is then given by

$$\alpha'=\alpha+E.$$

Consider the single-screen configuration with a display window **52** for a location P that is determined by its coordinates x,y in the window F specified by a height H and a width L and for a given scale, then objects are displayed that lie within the rectangle **50** (ABCD) using conventional display procedures.

The vertical axis NS shows north and south as they appear in the digital map.

If the angle α' is not equal to 0, then a new rectangle **51** (A',B',C',D') is calculated by performing rotation through an angle α' about the point P. The vertical N'S' of the new rectangle is no longer north/south but is the direction in which the appliance is then oriented. The rectangle **51** (A',B',C',D') is then displayed in the window F after being subjected to rotation in the opposite direction through an angle α' about the point P.

FIGS. **7** and **8** show two examples of cartographic data displays.

In FIG. **7**, it can be seen that certain symbols **53** are displayed horizontally whereas other symbols **54** are displayed parallel to the road network that defines them.

In FIG. **8**, which shows an enlarged portion of FIG. **7** after rotation through the angle α', it can be seen that the size of the legends has remained unchanged and that they continue to be displayed horizontally in spite of the map being rotated. Only data associated with a particular orientation (see reference **54**) has been rotated through the angle α'. It is also important to observe that the magnification (zoom) has caused new objects to appear, such as those referenced **55** or **56**, with this facility being made possible by the fact that the cartographic information is organized in levels. For each object, a threshold level is defined at which that object appears, i.e. the scale from which it is to be displayed on the screen.

It has thus been observed that the device of the invention has multiple advantages: because it is self-contained it can be used equally well in the office, at home, in a vehicle, and in association with any kind of displacement (walking, cycling, sailing, horseriding, etc. . . .); because of its power it provides access that is quick, easy, and interactive with data that is very fine and varied. It is particularly useful because of its "guidebook" function, since present guidebooks on paper are very poor due to reasons of bulk and are incapable of dynamically linking texts and maps. It can be personalized very easily, thus making it possible to have functions that are specific to certain companies, certain professions, certain recreational activities, and routes can be optimized in complex manner on the basis of parameters that account of choices and constraints applicable to each of those cases; finally, because of its high degree of functionality, it is particularly suitable for consumer applications (or even games such as treasure hunting) while nevertheless remaining suitable for professional use as can be reinforced by the optional presence of diary functions and of directory functions that facilitate preparation for a business trip (it has also been mentioned that it is possible to fit an external keyboard to the device).

It is of interest to observe that the power of the self-contained portable reader can be reinforced by adding a global positioning system (GPS) module to enable positioning to be determined, and by adding an altimeter for enabling altitude to be measured, with these two additional elements being particularly useful for travel in the wild, or in areas that are poorly sign-posted (rallying, for example).

I claim:

1. A portable appliance for displaying geographical data, in particular topographical or road maps, recorded on magnetic or optical media and organized on a plurality of levels, the appliance comprising a central processor unit associated with memories and I/O interfaces, said central processor unit

selectively displaying objects constituting said geographical data in one of said plurality of levels depending on a desired display scale, means reading said magnetic or said optical media, at least one display screen for displaying said geographical data, and having a horizontal and a vertical axis, means for inputting control information to said central processor unit, and, electrical power supply means for powering said appliance, the appliance further including a compass for measuring the angle between the vertical axis of said display screen and magnetic north, and to send corresponding control information to said central unit based on said measured angle, said central unit responding to said corresponding control information by issuing a command to the display screen to cause the displayed image to be oriented as a function of said corresponding control information, wherein data symbols and legends are selectively imposed upon the associated displayed image in order to make said symbols and said legends readable.

2. An appliance according to claim 1, wherein said display screen comprises two display screens coupled to said central processor unit and being suitable respectively for displaying a portion of a digital map and any text information, a picture, and an icon.

3. An appliance according to claim 1, wherein said electrical power supply means is provided from at least one battery within said appliance.

4. An appliance according to claim 1, wherein said appliance can be taken on board a vehicle, with electrical power supply to the appliance being provided from a battery of the vehicle.

5. An appliance according to claim 1, further comprising means coupled to said central processor unit enabling location-specific multimedia information to be recorded and to be played back.

6. An appliance according to claim 1, further comprising means for recording and displaying geographical data associated with a route that has been previously planned or travelled, said geographical data associated with said route including time, distance, and changes in altitude.

7. An appliance according to claim 1, further including means for enabling other information to be recorded on said magnetic or optical media for display on the map, said other information including directory or diary information.

8. An appliance according to claim 1, wherein said display screen is touch-sensitive.

* * * * *

United States Patent [19]

Gray et al.

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[45] **Date of Patent: Apr. 28, 1987**

[54] **VIDEO MAP DISPLAY**

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[73] Assignee: **British Telecommunications plc**, United Kingdom

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[51] **Int. Cl.**[4] **G09G 1/14**

[52] **U.S. Cl.** **340/744**; 340/724; 340/734; 340/995

[58] **Field of Search** 340/723, 724, 731, 734, 340/744, 747, 995

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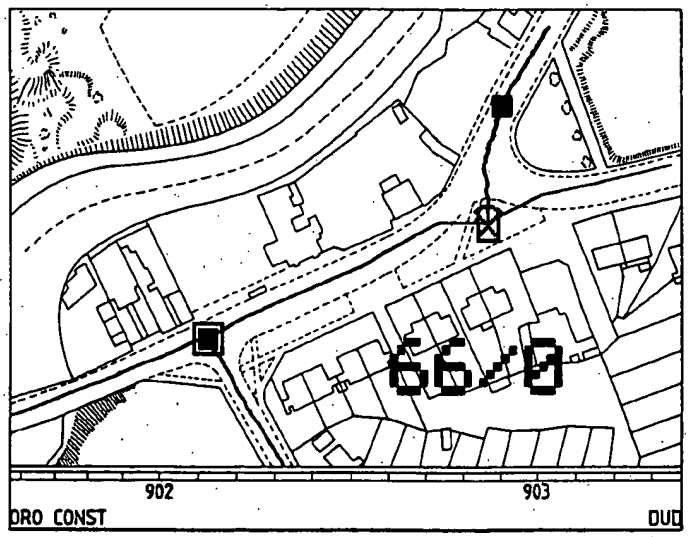
Assistant Examiner—Vincent P. Kovalick
Attorney, Agent, or Firm—Nixon & Vanderhye

[57] **ABSTRACT**

Map frames are stored on a video storage medium such as video disc, and a graphics generator stores overlay information such as the location of telephone lines plant. To accommodate maps of different scales covering the same area, the graphics generator applies a corresponding scaling factor to generation of the overlay image, for accurate superimposition of the map. Provision may also be made for correcting inaccuracies in the original process of recording the map frames.

14 Claims, 4 Drawing Figures



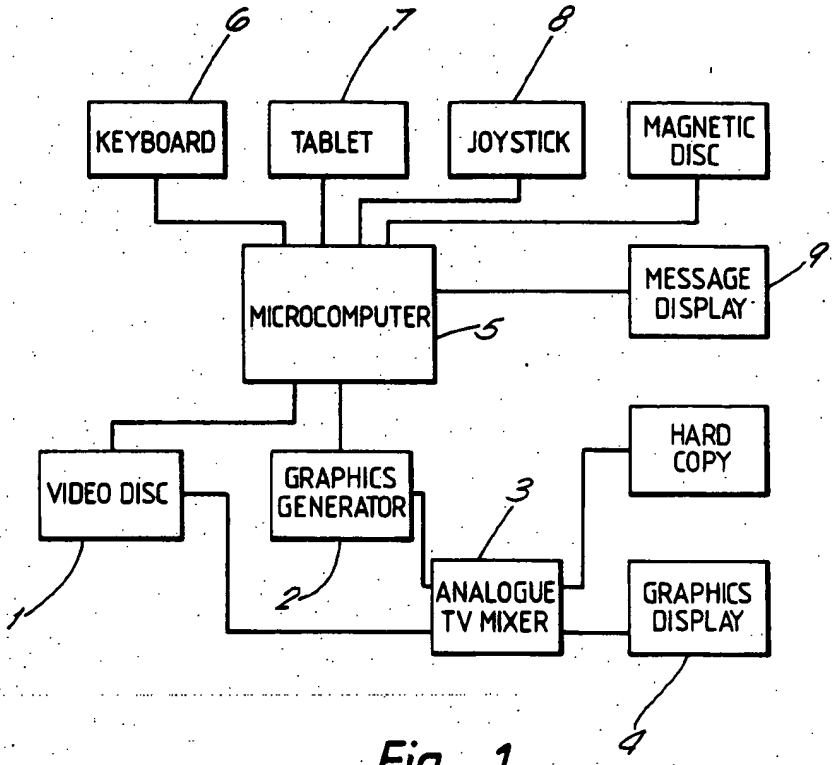

6
7
8
KEYBOARD
TABLET
JOYSTICK
MAGNETIC DISC
MICROCOMPUTER
5
MESSAGE DISPLAY
9
HARD COPY
VIDEO DISC
GRAPHICS GENERATOR
3
ANALOGUE TV MIXER
GRAPHICS DISPLAY
1
2
4

Fig . 1.

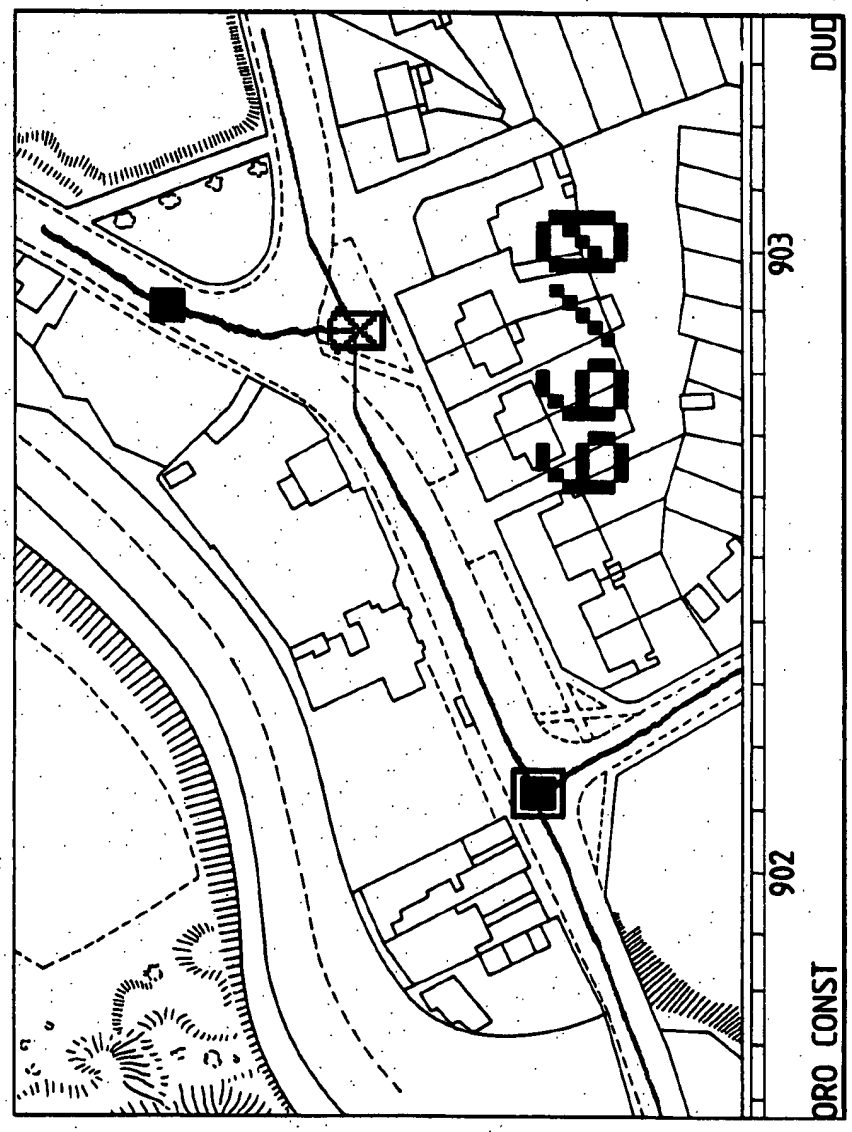


Fig. 2.

Fig . 3.

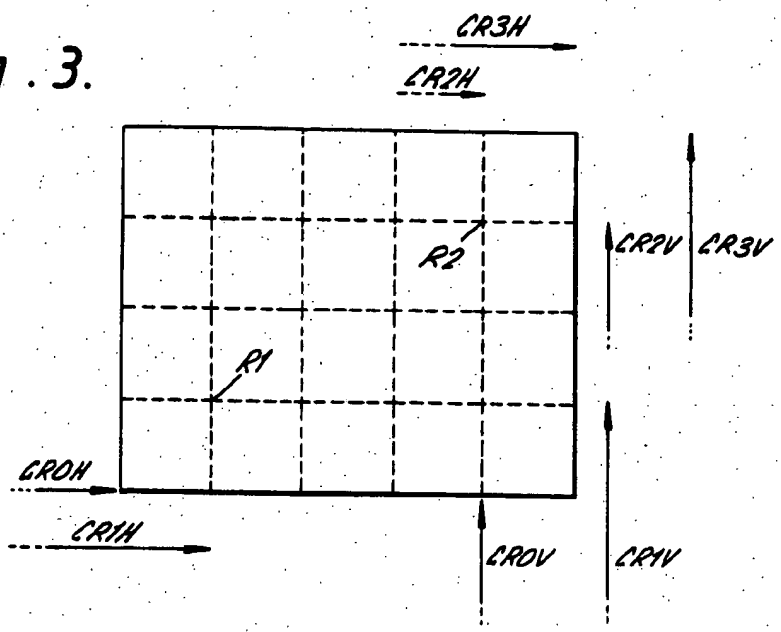
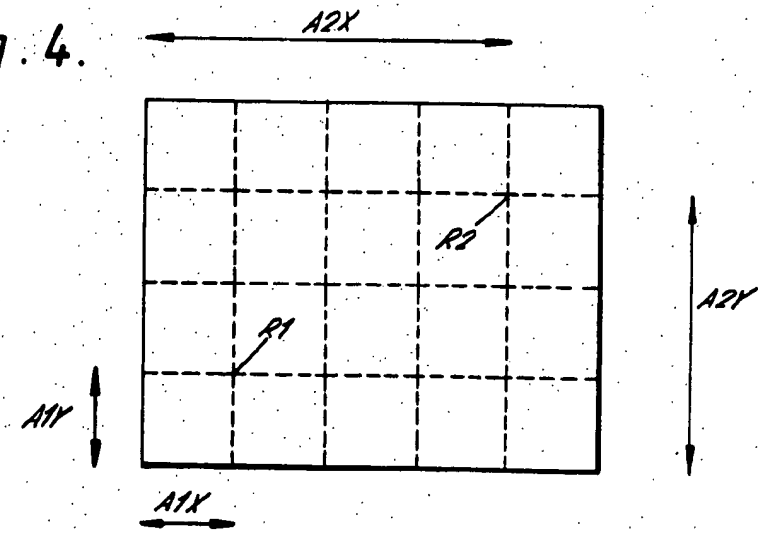

CR3H
CR2H
R2
CR2V
CR3V
R1
CR0H
CR1H
CR0V
CR1V

Fig . 4.


A2X
R2
A2Y
R1
A1Y
A1X

VIDEO MAP DISPLAY

There are many applications where the display of information in relation to a map background is a major requirement e.g. the updating of line plant records by public utilities (telephones, gas, water, electricity etc.), display of management information statistics related to geographical areas, military command and control systems, etc.

There is an obvious attraction in transferring all this information onto a computer, to give easier retrieval and updating of the records. However, attempts to computerise map-related data have in the past faltered over the difficulty of displaying the map information alongside the recorded data. For the computer to be able to display maps on a graphics terminal, the maps have first had to be digitised into vector form, and the vectors stored in a computer database. This system, whilst allowing the map data (e.g. position of roads, new houses, etc.) to be easily amended, has three major disadvantages:

(1) There is so much detail on maps used for purposes such as line plant records that the resulting vector coded data occupies about 1 Mbyte of computer storage for each square kilometer of a 1:1250 scale map. To cover usable area, say 400 km^2, a major city or a Telephone Area, the resulting storage requirement (400 Mbytes) necessitates a large disc system, with the computer to hold all the map information, and is therefore costly to provide.

(2) Depending on the size of the area to be viewed, it can take several minutes to draw the map background at the graphics terminal, particularly if it is connected to a remote computer using a serial data link.

(3) Digitisation is a time-consuming and expensive process—Ordnance Survey are in the process of digitising all their maps of Great Britain, but do not expect the task to be completed before the year 2000, although the majority of high density urban areas may become available sooner.

According to the present invention there is provided an information display apparatus comprising video reproduction means for producing video signals from a storage medium representing any one of a plurality of map frames of different scales recorded on the medium, graphic generator means for generating, from overlay information in digital form, video signals representing all or part of the said overlay information, means for combining the said video signals, control means including means for storing the overlay information and arranged in operation in response to information indicative of the geographical area covered by, and the relative scale of, a map frame selected for display to select from the overlay storage means overlay information in respect of that area and to control the graphic generator means so as to display the overlay information at the same scale as the map frame.

The type of video reproduction means is not critical to the invention; however, the use of videodisc storage is preferred in view of its large storage capacity, relatively low cost and ease of still frame reproduction, as compared with, for example, magnetic tape.

By using a videodisc to hold the map background and overlaying it with vector coded database information:

(1) Hard copy maps can be stored onto 35 mm cinematography film or videotape and transferred onto a videodisc hence removing the need for vector coding.

(2) The videodisc has a vast storage capacity thus enabling large geographic areas to be stored at low cost. A typical videodisc has a storage capacity of around 50,000 frames per side; even storing different scale maps still allows an area of about 200 square kilometers to be held on one side of a disc and viewed down to the level of a 100 meter square.

(3) The cost of the videodisc player and reproduction discs is sufficiently low that each graphics workstation could be provided with its own videodisc player.

One embodiment of the present invention will now be described by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a block diagram of a map display apparatus;

FIG. 2 illustrates a typical display; and

FIGS. 3 and 4 illustrate the use of reference points.

FIG. 1 shows a block diagram of a typical map display system. A videodisc player 1 provides for retrieval of map frames stored on a videodisc: although intended for the display of moving pictures, videodisc players have extremely good still-frame facilities, and can rapidly jump to any other still-frame required under automatic control. If necessary for larger areas, more than one player could be used. Overlay information is generated by a vector graphics generator 2 (e.g. the Sigma type 5664), its RGB video output being combined with that of the video disc player 1 in a vision mixer 3 for display on a raster-scan colour monitor.

The action of the vision mixer is controllable. A straightforward analogue TV mix yields an image in which map detail and vector information are equally combined thus allowing the map detail, in some instances, to obscure the vector information. Alternatively, the mixer has the ability to give priority to the vector information such that it overlays the map detail.

The mixer may also be provided with a number of additional facilities to aid the operator: the map background can be turned off to enable the line plant detail to be seen more clearly; all computer generated vector information can be switched to peak white in order to improve the hard copy output; finally, the map can be displayed in reverse video to compare the output directly with that obtained from a vector coded map.

A video hard copy device provides an A4 size copy of the combined picture. A portion of map overlaid with line plant data is shown in FIG. 2 by way of illustration.

System control is provided by a microcomputer 5. This serves to interface to the user via a keyboard 6, to graphics tablet 7 and joystick 8, and to carry out the functions of:

(i) storage and retrieval of indexing, control and overlay data

(ii) control of the videodisc player for map frame selection

(iii) processing of overlay data and transmission to the vector graphics generator.

A text display monitor 9 is also included to show the status of the system and messages to the user. It could easily be developed to display textual information from the database (e.g. information about cables in a particular duct) or information derived from the graphics display (e.g. the distance between two points).

Before describing the system operation in detail, a brief specification of the facilities offered will be given, followed by particulars of the data storage requirements.

1. It is assumed that an area of 200 km^2 is covered by each videodisc; and that map frames can be displayed at a number of scales in which, respectively, the map displayed on the monitor covers a nominal area of:

level 0—the entire area
level 1—km square
level 2—1 km square
level 3—300 m square
level 4—100 m square

2. For interface with the user, and for certain purposes within the system, a coordinate system is employed; conveniently this can be (in the UK) the National Grid system. The graphics generator requires information to be input in terms of pixel coordinates e.g. assuming a resolution of 768×512 picture elements, x-y coordinates with x in the range 0 to 767 and y in the range 0 to 511.

3. The user is initially presented with the level 0 map frame: he can "zoom" to level 1 and/or to more detailed maps, by positioning a cursor; or return to a lower level. He can "pan" across the map, horizontally, vertically or diagonally, causing the system to display the appropriate adjacent frame; or jump to another position by entering the National Grid reference or other identification.

4. The parts of the overlay data which are displayed may vary with zoom level.

The database for a given area falls into two parts: the map information (on videodisc), and the overlay and indexing information (stored on a magnetic disc).

The map frame storage for the scales indicated comprises (assuming a ⅛ overlap at levels 1 and 3, for enhanced "panning" facility):

level	no. of frames	nominal area covered by frame
0	1	10 km × 20 km
1	200	3 km × 3 km
2	200	1 km × 1 km
3	20,000	300 m × 300 m
4	20,000	100 m × 100 m

The videodisc can be generated by photographing sections of maps of appropriate scale and then transferring them to disc; although an expensive process, the cost of producing further discs once a master has been produced is relatively low. If maps for the desired area are available in digital form, direct conversion to microfilm for transfer to videodisc is possible: the resulting system still benefits by not having to hold and transmit the vector coded maps.

The use of a videodisc does suffer from the disadvantages that (at present) it is a read only device. Once having cut a master disc of the map background, it is not possible to modify the maps without producing a new disc. Where map changes are infrequent, this does not present a problem but in applications where up-to-date maps are an essential requirement, the difficulty can be overcome by vector digitising of the map changes (which can then be displayed by the overlay system) accompanied by a 'white out' of the affected map area from the videodisc frame. When sufficient changes to the map have taken place, a new disc can be produced at relatively low cost. For some purposes, it may be preferred to use aerial photographs rather than maps.

For practical purposes (to allow for alignment errors, monitor edge masking and the like) the area covered by a given frame will be slightly larger than the nominal size given above. The accuracy of the photographic and disc production processes is also significant in terms of the measures which need to be taken to ensure adequate alignment between map background and overlay information, as will be seen below.

The following data (referred to as indexing data) needs, in general, to be associated with each map frame.

(a) Frame number—identifying the location of the map on the disc.
(b) Identification—defining which area of the map is displayed e.g. the National Grid Reference of the bottom left-hand corner of the nominal map frame area.
(c) Size—defining the size of the area displayed, this could be either the scale, or the National Grid Reference of another fixed point—e.g. the top right.
(d) Alignment data—defining the position and size of the map frame in relation to the raster-scan video output produced from the videodisc, e.g., pixel x-y coordinates of two grid-square corners.
(e) Adjacent frame—viz. frame numbers of the eight number adjacent frames on the same scale; frame number of the more detailed map covering the centre region of the current frame; frame number of the larger map covering the current frame.

It does not follow that all of this information has to be stored individually for each frame in every system; for example:

Identification and size data may not have to be stored if the frames are ordered in a fixed format on the videodisc in such a way that a fixed relationship exists between such data and the frame number. This, however, would place restrictions on the shape of area that could be covered by a single videodisc, and for many applications the loss of flexibility in this respect would be undesirable.

The adjacent frame numbers could, with a fixed format system, be calculated rather than stored. Also, adjacent frames could in principle be identified by searching the indexing data on the basis of Identification and Size; in general this would be too slow.

Alignment data, with ideally accurate photography, and disc production, might be rendered unnecessary, or might be held constant for all maps of a given scale; however this would substantially increase the cost of producing the disc.

Assuming that alignment is maintained for all maps of a given scale, then the "commissioning" of a new disc would require the user to call up one frame for each scale. In each case be would position, using a joystick or graphics tablet, a movable screen cursor to line up with two predetermined reference points on the map; ie. those points (b, c above) whose Grid references are recorded in the indexing data. The system would then record the cursor position as the alignment data.

In the system as shown in FIG. 1, the "panning" operation consists of display of the adjacent frame on the same scale: this can be simply achieved by retrieval of the appropriate adjacent frame number from the indexing data and calling up that frame from the videodisc player. A more sophisticated system might use a frame store into which parts of adjacent frames read from videodisc could, after conversion to digital form employing a suitable video digitiser, be entered, thereby effecting a more gradual panning action. In this situation the frame store forming part of the graphics genera-

tor might be employed (thus making the vision mixer unnecessary).

It is assumed here that the indexing data is stored in digital form such as on magnetic disc; although in principle it could be stored on the videodisc in suitably encoded form, e.g. during the field blanking interval. Obviously this does not apply to the alignment data which is not known until after the disc has been made. The alignment data could be generated by a 'once only' digitisation of the map to identify reference points within the frame, or by manually positioning a cursor on the displayed image. In a typical, relatively simple data structure, the overlay data is formatted as a number of variable-length blocks each defining a part of the overlay. Each block comprises:

1. block length
2. graphics type
   line or lines (L)
   filled area (F)
   text (T)
   symbol (S)
3. attributes
   colour
   style (continuous or dotted line, etc.)
4. identity—for systems displaying overlays from more than one source—e.g. to identify Water Board installations or Telephone equipment.
5. number of points
6. list of—National grid coordinates of points

OR N.G. reference followed by text codes
OR N.G. reference followed by symbol code.
For example

$$8{:}L{:}RD{:}W{:}4{:}0,\ \frac{2\pi}{3}{:}1,\ -\frac{\pi}{3}{:}-1,\ -\frac{\pi}{3}{:}0,\ \frac{2\pi}{3}$$

would define a red dotted line equilateral triangle, side length 2, centred on grid reference 0,0.

In the system as described, the order in which the blocks of overlay data are stored is of no significance. Also it will be noted that the data are referenced to National Grid coordinates and take no account of the manner in which the maps are stored on the videodisc.

For the purposes of the present description, it will be assumed that the computer has the indexing and overlay data available in its memory. In practice, the volume of data will be such that not all of it will be in memory at any given time and thus callup of data from magnetic disc wil be necessary from time to time. The delays caused by this can be minimised by suitable organisation and/or formatting the data in such a way as to minimise the overlay data such that the parts of the magnetic disc in which it resides are related to the geographical position of the features which it represents. Much has been written on virtual memory and paging systems, and the subject will not, therefore, be discussed further here.

In operation, the computer will receive instructions from the user to display desired areas of maps, with or without overlay data, at desired scales. Whether this is achieved by typing instructions or a keyboard, or moving a joystick, position or cursor, or entry on a graphics tablet is not material; fundamentally the input will amount to specifying a given frame either (a) absolutely by its National Grid coordinates and scale, or (b) relatively, with respect to the current frame.

The computer's response, programmed in software, will be firstly (if necessary) to transmit to the graphics generator, (or vision mixer) an instruction to cease displaying any overlay information, then

(a) search the indexing information to identify the frame number of the map area of the specified scale and grid reference. OR

(b) locate the indexing information for the current page and read the appropriate adjacent page number according to the horizontal/vertical/diagonal pan or zoom-in/zoom out information specified.
   if the operation is a zoom-in to an area offset from the centre, the "adjacent page" number will be that of the frame corresponding to the centre. The indexing information for that page is therefore read to obtain the frame number of the offset page.
   transmit the frame number to the videodisc player.

By transferring the maps to the disc in a known sequence, it is possible to derive the next frame number to enable a move in any direction by direct calculation from any starting position. Likewise, by holding smaller scale maps at a known position on the disc relative to the larger scale maps, it is possible to derive the next frame number to enable a zoom in or out by direct calculation from any starting position.

Having derived the required frame number, it now becomes necessary to calculate the world coordinates of the map view in order that vector information from the graphics database can be overlayed precisely on the map background. Graphics information is held in National Grid coordinates and map frames have been placed on the disc with a known National Grid reference point (datum) at the bottom left and top right corners.

The coordinates of these reference points can be derived by calculation from the frame number and scale. If it could be guaranteed that these reference points were in precisely the same place on the disc frame, there would be no problem in matching the data to the map. However, in practice, this is not the case since small variations do occur during the disc mastering process.

For each frame, therefore, the frame display software must look up the deviation of the reference points from a known point and apply this correction before true overlaying of the data can occur.

Thus, assuming the simple data structure described above, the following sequence is then entered:

1. Read from the indexing data the Grid reference and scale of the (now) current frame and establish the nominal grid reference limits of the frame.
2. From the nominal limits and the alignment data, compute the conversion data, viz the G.R coordinates of pixels 0,0 and 767, 511 and scaling factors representing G.R. increment per pixel in x and y directions.
3. Examine the first block in the overlay data and ascertain whether any part of the feature (line, block, text, symbol etc.) represented lies within the grid reference limits of the current frame. If not, examine the next and subsequent blocks until one is found which does lie within those limits.
4. Translate the grid reference(s) of the point(s) defining that feature or part of a feature into pixel x-y coordinates by
   (a) computing the G.R. offset of each such point relative to the datum of that frame

(b) multiplying the G.R. offsets by the scaling factors to give the pixel x-y coordinates relative to the datum.

5. Transmit the pixel x-y coordinates to the graphics generator, accompanied by the remaining overlay data from that block—viz. colour, attributes, text, symbol codes etc.

6. Repeat steps 3 to 5 until all blocks have been examined.

A computer program, in BASIC, for carrying out this procedure, suitable for a small system in which all the data can be handled as program variables is given below.

It is assumed that the horizontal and vertical grid references of these reference points at the bottom left and top right of frame N are entered as variables GR1H(N),GR1V(N) and GR2H(N),GR2V(N); and pixel coordinates (alignment data) of these points being A1X(N),A1Y(N), and A2X(N),A2Y(N). Upon entry, N is set to the current frame number. The overlay data blocks are assumed to be entered into array elements DB(M,P). M is the block number (varying from 0 to N BLOCK), P is the element of the block, elements 1 to 5 representing the block length, type, attributes, identity and number of points—as described above—and pairs DB(M,6), DB(M,7) etc are the grid references of the points. DISPLAY Is a subroutine which passes DB(M,1) to DB(M,5) and pixel coordinates PX(.) to the graphics generator.

```
10  REM CALCULATE SCALE FACTORS
20  LET KH = ( A2X(N) - A1X(N) ) / ( GR2H(N) - GR1H(N) )
30  LET KV = ( A2Y(N) - A1Y(N) ) / ( GR2V(N) - GR1V(N) )
40  REM CALCULATE FRAME LIMITS
50  LET GROH = GR1H - KH*A1X(N)
60  LET GROV = GR1V - KV*A1Y(N)
70  LET GR3H = GROH + KH*768
80  LET GR3V = GROV + KH*512
90  REM Deal with each block in turn
100 FOR I = 0 TO NBLOCK
110 REM Check whether any part of graphics represented by
the block falls within frame
120 LET FLAG = 0
130 FOR J = 0 TO 2*( DB(I,5) - 1 ) STEP 2
140  IF  DB(I,J+6)  >=  GROH  and  DB(I,J+6)  <=  GR3H  AND
DB(I,J+7) <= GROV AND DB(I,J+7)  = GR3V THEN LET FLAG = 1
150 NEXT J
160 REM Skip if it doesnt
170 IF FLAG = 1 THEN GOTO 250
180 REM Convert to pixel coordinates
190 FOR J = 0 TO 2*(DB(I,5) - 1) STEP 2
200 LET PX(J) = ( DB(I,J+6) - GROH ) / KH
210 LET PX(J+1) = ( DB(I,J+7) - GROV ) / KV
220 NEXT J

230 REM ...and display the block
240 GOSUB DISPLAY

250 NEXT I
260 END
```

In practice, it may be found that this procedure is relatively slow, and economies of processing speed may be made by selecting a data structure in which the location of the data blocks is related to the geographical position of the feature which the data represents.

The graphics database software can be similar to many interactive, graphical editors and provide facilities for the insertion of areas, vectors, text, symbols and circles. Parameters, (colour, line width, level, etc.) can be associated with each data item. Data so entered can have their parameters changed and be moved, copied or deleted. Full advantage can be taken of the graphics processors' ability to selectively erase vector data for move and delete operations and the usual facilities provide to save, restore and clean up the graphics database.

The advantages of this system compared with a fully digital system are that the computer is relieved of the task of storing the map data, sifting through the map data to find the relevant sections relating to the required display area, and sending the map data over a serial link. This means that for a great many applications, the power of a large mainframe computer is no longer necessary, and a self-contained workstation incorporating a microcomputer will be adequate.

We claim:

1. An information display apparatus comprising:
video reproduction means, adapted for connection to a storage medium having data recorded thereon representing a plurality of map frames of different scales, for producing first video signals representing a selected one of said plurality of map frames;
graphic generator means for generating, from prestored overlay information in digital form, second video signals representing an overlay image;
means connected to said video reproduction means and said graphic generator means for combining said first and second video signals; and
control means connected to said graphic generator means and including means for storing information representing said overlay image, said control means for selecting, in response to information indicative of the geographical area covered by, and the relative scale of, (a) said selected map frame, overlay image information stored by the overlay information storage means corresponding to said geographical area and for controlling the graphic generator means to display the overlay information at the same scale as the map frame.

2. Apparatus according to claim 1 in which the video reproduction means is a videodisc player.

3. Apparatus according to claim 1 or 2 including further control means connected to said video reproduction means and said overlay control means manually operable for controlling the video reproduction means to produce video signals representing a map frame geographically adjacent to the map frame previously displayed, the overlay control means being responsive thereto to select the corresponding overlay information.

4. Apparatus according to claim 3, further including a frame store, and store control means, connected to said frame store and to said video reproduction means, for forming in the store a frame for display, said frame comprising parts of two or more map frames stored on the storage medium.

5. Apparatus according to claim 1 further including means, connected to said graphic generator means and adapted for operative connection to said storage medium, for storing alignment information indicating in respect of each, or each group of, frames recorded on the storage medium any offset between the recorded frames and a coordinate system to which the digital overlay information is referenced, the graphic generator means being responsive to said alignment information whereby the overlay information is aligned with the displayed map information.

6. A geographical image display apparatus comprising:
video reproducing means, adapted for connection to a source of video signals representing plural predetermined map images depicting a geographical area at different, fixed levels of resolution, said video reproducing means for: (a) selecting one of said levels of resolution, and (b) selecting and outputting the video signals corresponding to said selected level of resolution;
graphics generator means, electrically connected to said video reproducing means and to said digital signal storing means, for (1) determining a scale factor of the image represented by said selected video signals, (2) producing digital signals representing a predetermined overlay image corresponding to said geographical area, said overlay image including plural features corresponding to geographical locations within said area, (3) processing said digital signals in accordance with said determined scale factor, and (4) generating and outputting video signals representing said overlay image scaled to match the determined scale factor; and
video mixing means, connected to receive the video signals outputted by the video reproducing means and the graphics generating means, for mixing said video signals to generate video signals representing a composite video image depicting said geographical area at said selected resolution overlayed by said overlay image, the features of said overlay image corresponding to locations within said geographical area being superimposed, in said composite image, in registry with portions of said map image depicting said locations.

7. A method of displaying geographical images comprising the steps of:
(1) selecting, from video signals representing plural predetermined map images depicting a geographical area at different, fixed levels of resolution, video signals representing an image at one of said levels of resolution;
(2) producing digital signals representing a predetermined overlay image corresponding to said geographical area, said overlay image including plural features corresponding to geographical locations within said area;
(3) determining a scale factor of the image represented by said selected video signals:
(4) processing said digital signals produced by said producing step (2) in accordance with said determined scale factor;
(5) generating, from said processed digital signals, video signals representing said overlay image scaled to match the determined scale factor; and
(6) mixing said video signals selected by said selecting step (1) with said video signals generated by said

generating step (5) to generate video signals representing a composite video image depicting said geographical area at said selected resolution overlayed by said overlay image, the features of said overlay image corresponding to locations within said geographical area being superimposed, in said composite image, in registry with portions of said map image depicting said locations.

8. A geographic image display apparatus comprising:

video reproduction means, adapted for connection to a storage medium storing video information representing plural predetermined map video images depicting corresponding discrete geographical areas, said predetermined map images having different, fixed scale factors, said video reproduction means for: (a) selecting one of said plural map images, (b) retrieving, from the storage medium, the image data corresponding to said selected image, and (c) producing first video signals representing said selected map image;

graphics generator means electrically connected to said video reproduction means for generating second video signals representing an overlay image corresponding to said selected map image, for determining the scale factor of said selected map image, and for varying the scale of said overlay image to match the determined scale factor; and

video mixing means, connected to receive the first and second video signals, for mixing said first and second video signals to generate output video signals representing a composite video image of said map image overlayed by said overlay image.

9. An apparatus as in claim 8 wherein said graphics generator means includes:

overlay data storing means for storing data representing overlay images associated with said geographical areas; and

processing means connected to said overlay data storing means and preprogrammed to perform the following functions:

(a) retrieve the stored data representing an overlay image associated with the geographical area depicted by the selected map image,

(b) compute a variable scaling factor for said retrieved overlay image data in response to the scale factor of said selected map image so as to match the scale factor of the overlay image with the scale factor of the selected map image,

(c) process said overlay image data in response to said computed variable scale factor, and

(d) convert the processed overlay image data to said second video signals.

10. An apparatus as in claim 8 wherein said graphic generator means includes:

overlay data storing means for storing data representing overlay images associated with said geographical areas; and

processing means connected to said overlay data storing means and preprogrammed to perform the following functions:

(a) retrieve the stored data representing an overlay image associated with the geographical area depicted by the selected map image,

(b) process said retrieved overlay image data in response to the scale factor of said selected map image so as to match the scale factor of the overlay image with the scale factor of the selected map image,

(c) further process said retrieved overlay image data so as to superimpose features of said overlay image indicative of geographical locations in registry with points of said selected map image corresponding to those geographical locations, and

(d) convert the further processed overlay image data to said second video signals.

11. An information display apparatus comprising:

information storing means for storing: (a) signals representing plural discrete map images depicting corresponding discrete geographical areas, (b) data associated with each image identifying the geographical location of the geographical area said image depicts, and (c) data associated with each image specifying the relative scale factor of said image;

video reproduction means operatively connected to said storing means for selecting any one of said map images, for retrieving, from said information storing means, the map image signals, location data and scale factor data associated with said selected image, and for converting said retrieved image signals to video signals;

graphic generator means connected to receive said retrieved location data and scale factor data for generating video signals representing an overlay image having a scale factor corresponding to said selected map image and depicting features indicative of the geographical location of said selected map image; and

video mixing means, connected to receive the video signals generated by said video reproduction means and said graphic generator means, for mixing said video signals to generate video signals representing a composite map and overlay video image.

12. An information display apparatus as in claim 11 wherein:

the location data stored by said information storing means specifies a geographical grid reference corresponding to the geographical location of the area depicted by the map image associated therewith; and

said graphic generator means includes:

overlay storing means for storing (1) data representing plural predetermined overlay images associated with and corresponding to said plural map images, said overlay images being scaled to match the scaling of said map images corresponding thereto and depicting geographical features indicative of the geographical areas depicted by said map images corresponding thereto, and (2) indexing data associated with said overlay image data specifying geographical grid references corresponding thereto; and

means operatively connected to said overlay storing means and to said video reproduction means for selecting stored overlay image data having indexing data associated therewith matching the geographical grid reference corresponding to the selected map image.

13. An information display apparatus as in claim 12 wherein:

said apparatus further includes input means, operatively connected to said video reproduction means, for specifying a geographical grid reference;

said video reproduction means selects one of said images in response to a geographical grid reference specified by said input means; and

said stored overlay data selecting means selects stored overlay data in response to said geographical grid reference specified by said input means.

14. An information display apparatus as in claim 11 wherein:

said graphic generator means generates an overlay image depicting geographical and/or cartographical features corresponding to the geographical area depicted by said selected map image; and

said video mixing means includes aligning means for superimposing said features of said overlay image with corresponding geographical locations represented by said map image.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 4,661,811

DATED : April 28, 1987

INVENTOR(S) : Michael J. Gray and Ian Langdon

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Delete (a) from claim 1 at col. 9, line 44.

Signed and Sealed this

Sixth Day of October, 1987

Attest:

Attesting Officer

DONALD J. QUIGG

Commissioner of Patents and Trademarks

United States Patent [19]

Slemmons

[11] **3,731,387**

[45] **May 8, 1973**

[54] **STOCK MARKET CHARTING APPARATUS**

[76] Inventor: **John W. Slemmons**, 19142 Glen Albyn, Orange, Calif. 92667

[22] Filed: **Sept. 9, 1969**

[21] Appl. No.: **856,359**

[52] **U.S. Cl.** ..... **33/76 R**

[51] **Int. Cl.** **B43l 7/00**

[58] **Field of Search** 33/75, 76, 80, 103, 33/95, 1

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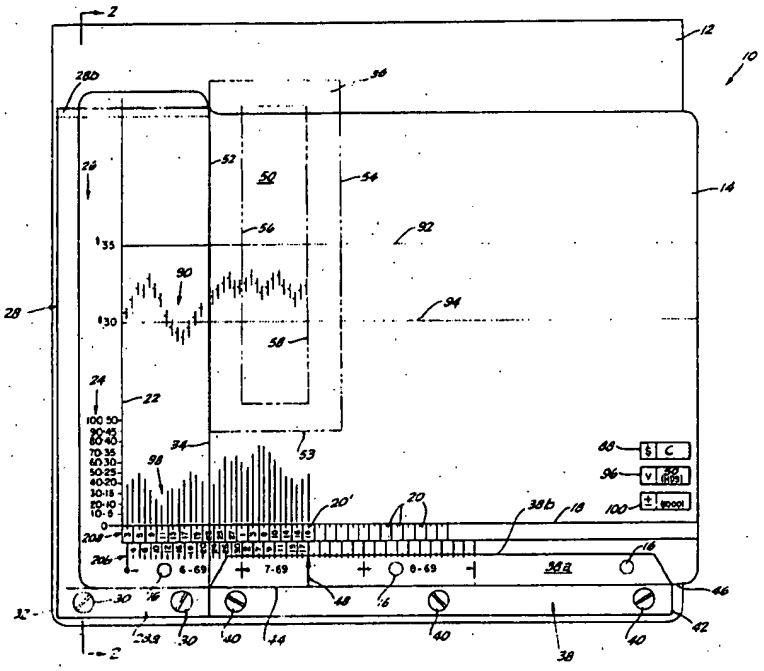
Primary Examiner—Harry N. Haroian
Attorney—Hinderstein and Silber

[57] **ABSTRACT**

Apparatus for plotting stock market data. Included is a rectangular rule having along the edges of a central rectangular opening a plurality of scales of different incremental spacing. A charting sheet is positioned with an edge against a chart guide and with a selected point on the abcissa aligned with an index mark on the chart guide. When the rule is placed against a rule guide, a scale edge of the rule is lined up with the selected point, thereby facilitating easy entry of prices, volume or other data. In one embodiment the chart and rule guides are mounted on a notebook cover; in another embodiment the guides are combined in a unitary member adapted to engage an edge of the charting sheet.

15 Claims, 8 Drawing Figures



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SHEET 1 OF 3

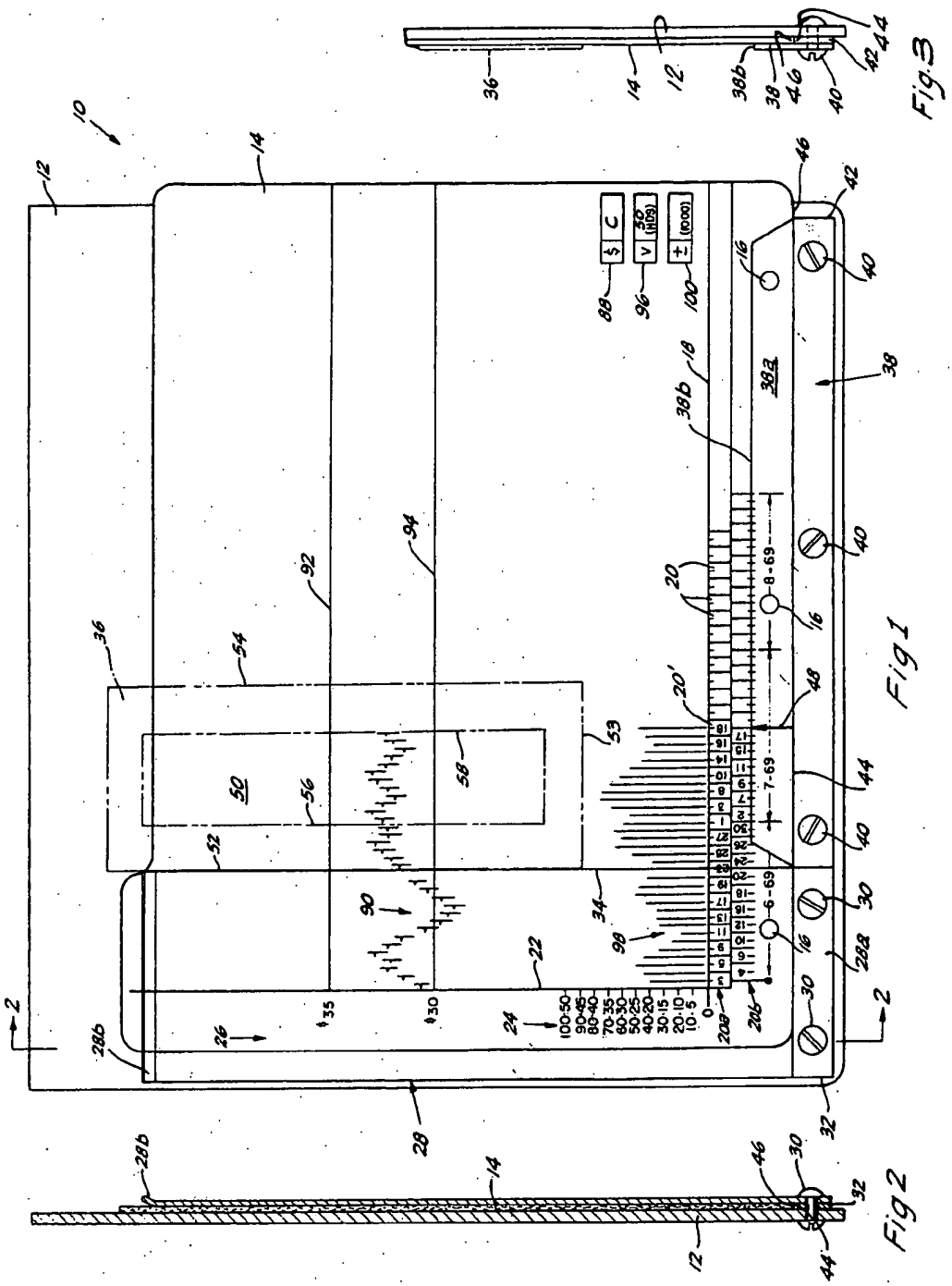

Fig. 3

Fig 1

Fig 2

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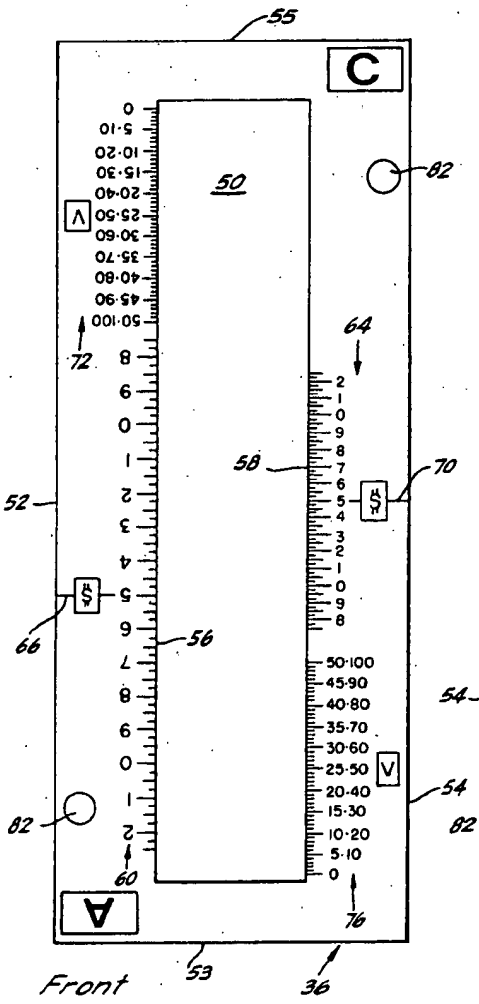

Fig 4

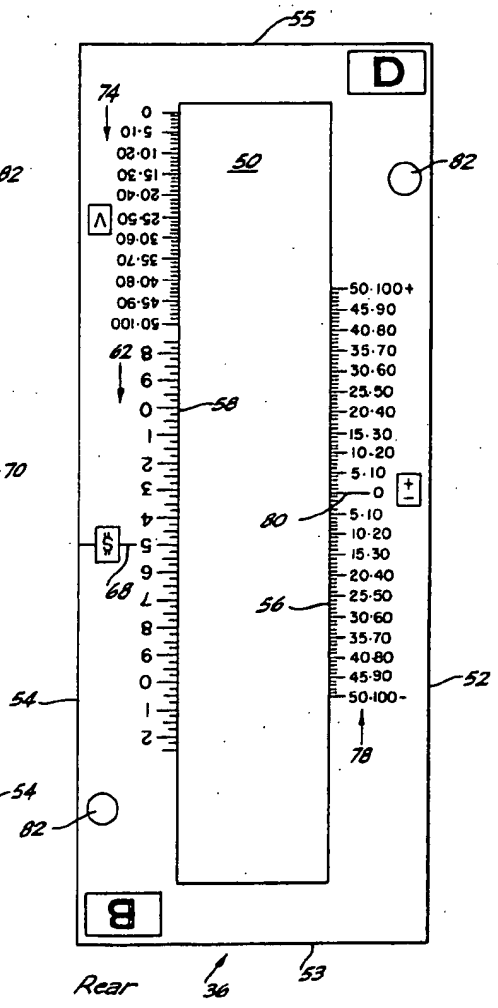

Fig 5

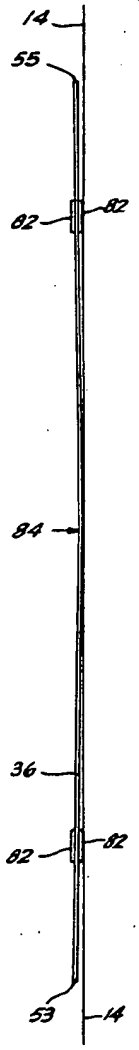

Fig 6

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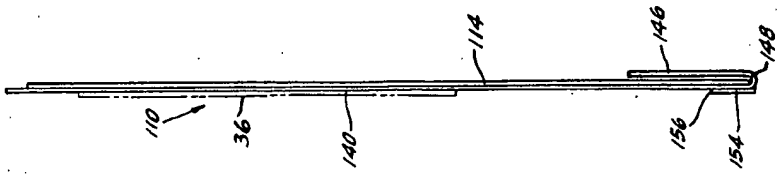

Fig 8

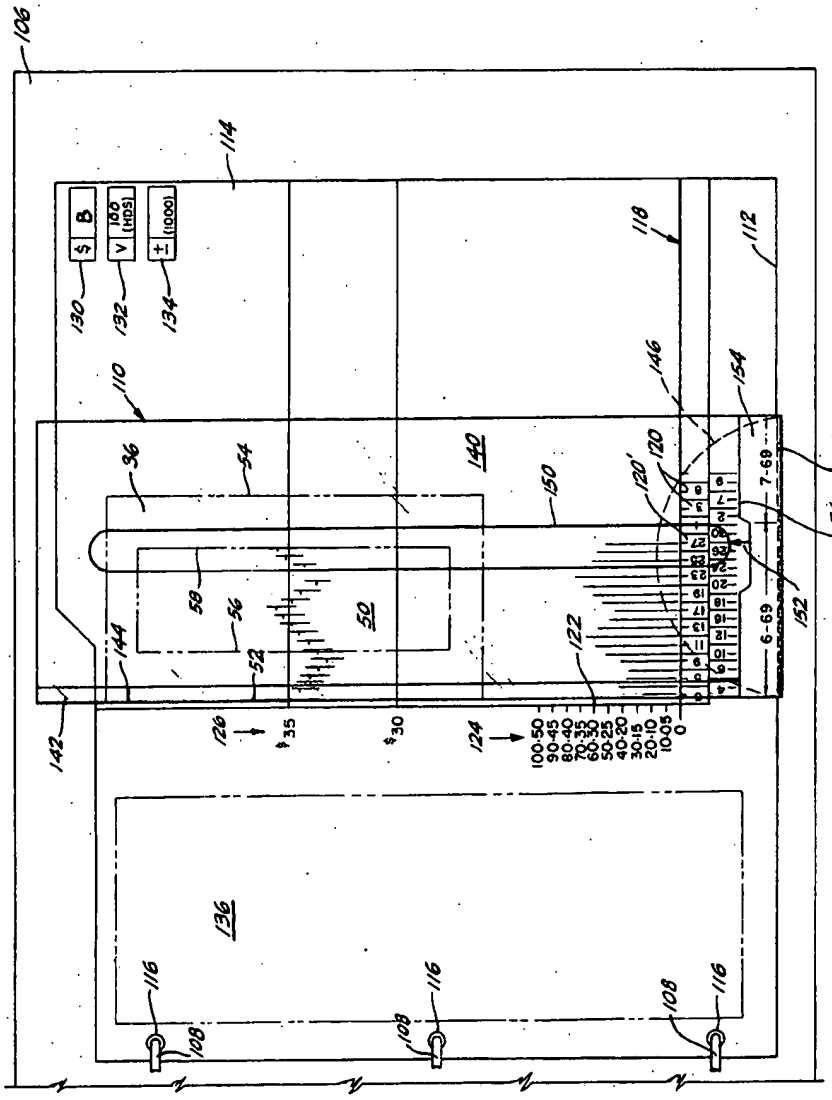

Fig 7

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STOCK MARKET CHARTING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an apparatus for plotting data on a charting sheet. More particularly, the invention relates to an apparatus including a rule, a rule guide and a chart guide which facilitate the preparation of charts displaying stock market data.

2. Description of the Prior Art

An increasing number of stock market investors find it of interest to chart various market statistics which indicate the day to day performance of a particular stock. In fact, some investors decide whether to buy or sell a particular stock depending on the occurrence of certain price, volume or other indicator chart features. The updating of such charts is time consuming, particularly when a number of stocks are being followed on a daily basis. Moreover, such charts must be accurate and cannot be haphazardly prepared, since small indicator fluctuations often are sufficient to motivate large purchases or sales of a particular stock.

In the past, preparation of stock market charts has been a tedious process usually carried out with a straight edge and a sheet of graph paper. Typically, such graph paper has a linear abcissa scale wherein five equally spaced divisions represent the five days of the week on which the securities market is open. Along the ordinant is a linear price scale divided into groups of eight divisions representing dollars and eighths of dollars.

To enter price information on such graph paper, the investor must note the high, low and closing prices of the stock for the day, find the corresponding points along the ordinant of the graph, follow these points horizontally across the graph until reaching the vertical position representing the present date, and then use a straight edge to prepare a vertical line from the low to the high price, which line is crossed with a short horizontal mark at the closing price. Obviously, this routine is both tedious and likely to produce error.

Moreover, there is a tendency to use the same ordinant spacing to represent a price fluctuation of one dollar, regardless of whether this variation occurs in a stock priced at 10 dollars or several hundred dollars. Accordingly, for the low price stocks, the price fluctuations tend to be over-emphasized on the chart, whereas for high price stocks, price trends are hard to visualize.

Similar difficulties are experienced when making charts of other stock market indicators. Typical of such indicators are the "Volume-Price Trend" described by David L. Markstein in the book "How to Chart Your Way to Stock Market Profits", published in 1966 by Parker Publishing Company, and the "On-Balance Volume" indicator described by Joseph E. Granville in the book "Granville's New Key to Stock Market Profits" published in 1963 by Prentice-Hall, Inc. For these and other stock market indicators, price, volume and other stock data are combined to calculate a daily indicator value. Typically this value is a positive or negative amount possibly measured in incremental units related to the particular indicator. The problems associated with plotting such indicator data are similar to those discussed above, and no prior art apparatus is available for simplifying the charting of such data.

The present invention is directed toward providing an apparatus which permits the rapid, accurate plotting of stock market price, volume and other indicator information, in a form which permits optimum visual interpretation of the resultant chart.

SUMMARY OF THE INVENTION

In accordance with the present invention there is provided an apparatus for plotting stock market data and the like on a charting sheet. The apparatus comprises a substantially rectangular rule having adjacent elongate edges thereof, a plurality of price, volume and other scales of different incremental spacing. The apparatus also includes chart guide means which retains the abcissa of the charting sheet in perpendicular alignment with an edge of a rule guide. When a selected point along the abcissa is aligned with an index mark on the chart guide and an edge of the rule is placed against the rule guide, one or more of the scales will be in line with the selected abcissa point. Data then may be plotted using a rule edge both as a scale and as a guide for pencil or pen.

In a preferred embodiment, the rule includes a central rectangular opening parallel to the outer periphery of the rule. A plurality of price scales are provided adjacent edges of the opening, each price scale including approximately one decade of decimal price units. An identical volume scale is provided at one end of each rule edge containing a price scale. The rule also includes an indicator scale having plus and minus increments extending in opposite directions from a central zero index.

In one embodiment, the rule guide comprises a planar sheet of transparent plastic, one end of which is fixedly attached to a base, separated therefrom by a spacer. Typically, the base may comprise the cover a notebook. The chart guide comprises an elongate strip of transparent plastic fixedly attached to the base perpendicular to a straight edge of the rule guide, and separated from the base by another spacer. The index mark is located on the chart guide at a distance from the rule guide straight edge equal to one-half the width of the rectangular rule plus one-half of the width of the rectangular opening in the rule.

In another embodiment of the chart guide and rule guide are combined in a unitary member which also may be constructed of transparent plastic. The member includes a forwardly folded longitudinal edge which functions as the rule guide, and a rearwardly folded lip which functions as the chart guide. The unitary member also has an elongate opening the axis of which is parallel to the rule guide and aligned with the index mark on the chart guide.

To plot stock market data, the abcissa edge of the charting sheet is placed in contact with the chart guide, with the point on the abcissa for which data is to be entered aligned with the index mark. Typically, this point will be identified with a date for which stock market data is being charted. The rule is then placed on the charting sheet with the appropriate scale facing upward and with a peripheral elongate edge abutting against the straight edge of the rule guide. With the rule so oriented, the edge of the rule opening containing the desired scale will be aligned with the index mark, and hence will be lined up with the point on the abcissa for

which data is to be charted. This scale edge then is used both as pencil guide and scale for entering data directly on the charting sheet. The newly entered data immediately may be compared with data for the preceding few days, which recent data may be seen through the rule opening even before the rule is removed from the charting sheet.

Another significant feature of the present invention is the use of a rule having price scales which include only the units decimal (i.e., dollar) digit. In a preferred embodiment, the scales include approximately 15 major divisions or graduations, consecutively numbered 8,9,0,1,2,3,4,5,6,7,8,9,0,1 and 2. Each of these graduations further may be divided into fractional parts, typically eighths. An index mark is provided through the numeral "5" at the center of the scale. The price scale of such a rule then may represent $35 ± 5, $115 ± 5, $10 ± 5, etc; that is, the scale is independent of the tens or hundreds digit value of the price.

The use of a rule having the configuration just described facilitates rapid, accurate plotting of stock price information. Thus, if the price is fluctuating about $35; the rule is placed on the charting sheet, perpendicular to the abcissa, with the $5 index mark aligned with the $35 horizontal line on the chart. The graduations on the rule then represent the values $28 through $42. Since only rarely does a stock price vary more than about $10 per day, this range is sufficient to plot most daily fluctuations. Moreover, by using a scale which extends approximately plus or minus $7, the necessity for moving the scale vertically when the price crosses a 10 dollar increment is eliminated. For example, if the daily price variations should be from a low of $38 to a high of $41, the rule would not have to be moved or positioned twice to plot the data.

This it is an object of the present invention to provide an apparatus for charting stock market data and the like.

Another object of the present invention is to provide a novel rule for use in plotting stock market data.

It is another object of the present invention to provide a data plotting apparatus including a scale having approximately 15 major graduations representing units digits only of the data to be plotted, and which is positioned on a charting sheet in units digit positional correspondance with an ordinant scale on the charting sheet.

It is another object of the present invention to provide an apparatus for plotting data on a charting sheet including chart guide means engaging an edge of the chart and rule guide means for maintaining a rule in position to chart data.

Still another object of the present invention is to provide a charting apparatus including a rule having a plurality of scales adjacent edges thereof, and guide means for maintaining a selected edge of the rule in alignment with an index mark pointing to the abcissa position for which data is to be entered.

It is yet another object of the present invention to provide a stock market charting apparatus including a rectangular rule having a plurality of price, volume and other scales adjacent edges of a central rectangular opening therein, and including means for maintaining the abcissa of a charting sheet perpendicular to scale edges of the rule, a selected scale edge being aligned with the position on the abcissa indicating the date for which stock market data is to be entered.

Yet another object of the present invention is to provide a stock market charting apparatus attached to the cover of a notebook.

A further object of the present invention is to provide a stock market charting apparatus including a rule and a unitary member adapted to engage a charting sheet and to serve as a guide for positioning the rule on the sheet.

BRIEF DESCRIPTION OF THE DRAWINGS

Still other objects, features and attendant advantages of the present invention will become apparent to those skilled in the art from a reading of the following detailed description of the preferred embodiments constructed in accordance therewith, taken in conjunction with the accompanying drawings wherein like numerals designate like parts in the several figures and wherein:

FIG. 1 is a plan view of a first embodiment of the inventive apparatus for plotting stock market data on a charting sheet; in this embodiment a chart guide and a rule guide both are fixedly attached to a planar base which may comprise a notebook cover.

FIG. 2 is a sectional end view of the apparatus of FIG. 1 as seen generally along the line 2—2 thereof; the relationship between the rule guide, the base and the charting sheet is evident in this figure.

FIG. 3 is an end view of the apparatus of FIG. 1 showing the relationship between the chart guide, the charting sheet and the base.

FIGS. 4 and 5 respectively show front and rear views of a preferred embodiment of a rule which may be used with the stock market charting apparatus of FIGS. 1 or 7.

FIG. 6 is an edge view of the rule shown in FIGS. 5 and 6; the rule is shown disposed on a charting sheet and flexed to illustrate the function of raised feet provided on the rule.

FIG. 7 is a plan view of another embodiment of the inventive apparatus for charting stock market data; in this embodiment the rule guide and chart guide are combined in an unitary member.

FIG. 8 is an edge view of the chart and rule guide unitary member also illustrated in FIG. 7.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now the the drawings and particularly to FIGS. 1—3 thereof, there is shown a first embodiment 10 of the inventive stock market charting apparatus. The components of apparatus 10 are attached to a planar, substantially rectangular base 12 which may comprise the cover of a conventional three-ring, loose-leaf binder or other notebook.

Stock market or other data is plotted on a charting sheet 14 which may be printed on relatively thick paper of notebook size and having holes 16 which permit sheet 14 to be bound in a notebook for storage. Along the abcissa 18 of charting sheet 14 are a plurality of printed boxes 20 in which may be entered the date for which stock information is plotted. The boxes are arranged in staggered rows 20*a* and 20*b* to permit close spacing between data for successive days, while still allowing sufficient room within each box 20 to write the date.

Along the ordinant 22 of charting sheet 14 there is printed a pair of volume scales 24, the zero graduation of both scales coinciding with abcissa 18. One of the volume scales 24 is dimensioned in incremental units of five, the other in incremental units of ten. As described below, volume scales 24 may be used to plot the number of shares (in 100's) of a particular stock traded each day. The upper portion 26 of ordinant 22 is not pre-printed, but is used to enter stock price scale designations in increments of five dollars, as described in detail below.

Referring to FIGS. 1 and 2, charting apparatus 10 also is provided with a planar, substantially rectangular rule guide 28, preferably fabricated of transparent plastic. The lower end 28*a* of rule guide 28 is fixedly attached to base 12 by means of appropriate fasteners 30 such as the stud bolts illustrated. Fasteners 30 also extend through a spacer 32 having a thickness slightly greater than the thickness of charting sheet 14. The use of spacer 32 between rule guide 28 and base 12 allows charting sheet 14 to be positioned beneath rule guide 28 as illustrated. The upper end 28*b* of rule guide 28 is bent forward away from base 12 so as to facilitate insertion of charting sheet 14 behind rule guide 28. Rule guide 28 includes a straight edge 34 against which is positioned a rule 36 used to accomplish actual data plotting. The preferred configuration of rule 36 is described in conjunction with FIGS. 4 and 5 below.

As shown in FIGS. 1 and 3, apparatus 10 also is provided with a chart guide 38, preferably comprising an elongate strip of transparent plastic, attached to base 12 by means of fasteners 40. A spacer 42 preferably having the same thickness as spacer 32 is situated between chart guide 38 and base 12. Spacers 32 and 42 may be separate components, or may comprise a single elongate strip of plastic having an edge 44 perpendicular to straight edge 34.

The lower edge 46 of charting sheet 14 may be positioned against spacer edge 44, beneath a portion 38*a* of chart guide 38. Preferably, abcissa 18 is printed parallel to edge 46, so that as charting sheet 14 is moved along spacer edge 44, abcissa 18 remains perpendicular to straight edge 34 of rule guide 28.

Chart guide 38 is provided with an index mark 48 which is spaced an exact distance from straight edge 34. In particular, the perpendicular distance between straight edge 34 and index mark 48 is equal to the distance between the rule edge 52 or 54 positioned against straight edge 34 and the scale edge 58 or 56 along which data is plotted. When employing the preferred form of rule 36 illustrated in FIGS. 4 and 5, the perpendicular distance between straight edge 34 and index mark 48 is equal to half the width of rule 36 plus half the width of the rectangular interior opening 50 of rule 36. Thus when a selected box 20′ (see FIG. 1) along abcissa 18 is aligned with index mark 48 and when rule edge 52 is positioned against straight edge 34, scale edge 58 will be lined up with index mark 48 in position for plotting data corresponding to the date entered in box 20′.

FIGS. 4, 5 and 6 respectively show front, rear and edge views of a preferred embodiment of rule 36. As evident in these figures, rule 36 is rectangular in shape and includes outer elongate edges 52 and 54 and ends 53 and 55. The central rectangular opening 50 of rule 36 includes elongate edges 56 and 58 which are parallel to edges 52 and 54. Opening 50 is located so that the distance between edges 52 and 56 is equal to the distance between edges 54 and 58. Thus the distance between edges 54 and 56 is equal to the distance between edges 52 and 58, and also equal to half the width of rule 36 plus half the width of opening 50.

In the preferred embodiment illustrated, rule 36 includes three price ($) scales 60, 62 and 64. Price scale 60 is on the front of rule 36 adjacent elongate edge 56 and is designated "$ scale A"; price scale 62 is on the rear of scale 36 adjacent elongate edge 58 and is designated "$ scale B"; and price scale 64 is on the front of rule 36 adjacent elongate edge 58 and is designated "$ scale C". Each of price scales 60, 62 and 64 includes approximately one decade of decimal price units, the scales being centered about the respective $5 index marks 66, 68 and 70. Note that a different incremental spacing is provided on each of price scales 60, 62 and 64. In the embodiment shown, the incremental spacing representing one dollar on scale 64 is approximately half the spacing representing one dollar in scale 60. Similarly, the incremental spacing representing one dollar on price scale 62 is approximately three-fourths the spacing representing 1 dollar on price scale 60.

Referring still to FIGS. 4 and 5, rule 36 also is provided with three identical volume scales 72, 74 and 76 each having a double set of graduations corresponding in value and spacing to volume scales 24 printed on charting sheet 14 (see FIG. 1). Volume scale 72 is on the front of scale 36 adjacent elongate edge 56; volume scale 74 is on the rear of rule 36 adjacent elongate edge 58; and volume scale 76 is on the front of rule 36 adjacent elongate edge 58.

The spacing between rule end 53 and the zero graduation of volume scale 76 is equal to the spacing between rule end 55 and the zero graduation of volumes 72 and 74; this spacing also is equal to the vertical distance between the upper edge 38b (FIG. 1) of chart guide 38 and abcissa 18, when edge 46 of charting sheet 14 abuts against spacer edge 44. This insures that when rule end 53 or 55 is positioned against chart guide edge 38b, the selected volume scale on rule 36 will be aligned vertically with printed scale 24 on charting sheet 14.

The rear of rule 36 (see FIG. 5) also is provided with a ± scale 78 adjacent elongate edge 56. This ± scale 78 includes two sets of graduations extending in opposite directions from a central zero index mark 80. As described below, the ± scale 78 is used for plotting various stock market indicators other than price and volume.

Note in FIG. 4 that the scales 64 and 76 adjacent rule edge 58 are upside down with respect to scales 60 and 72 adjacent rule edge 56. This configuration makes it unlikely that the incorrect scale will be used to plot data when rule 36 is placed front side up on charting sheet 14. Thus, when edge 52 is positioned against rule guide edge 34, elongate edge 58 will be aligned with index mark 48; accordingly, data should be entered from scales 76 or 64. Since these scales are right side up, the operator is unlikely to enter data erroneously from one of upside down scales 60 or 72. Similarly, on the rear of rule 36 (see FIG. 5) scales 62 and 74 adjacent rule edge 58 are upside down with respect to scale 78 adjacent rule edge 56.

To facilitate lifting rule 36 off the surface of a charting sheet, both the front and rear of rule 36 are provided with raised feet 82. Typically each of raised feet 82 comprises a small plastic button or boss extending about 1/32 inch from the surface of rule 36. The function of feet 82 is indicated by edge view of FIG. 6 wherein rule 36 is shown disposed on the surface of charting sheet 14. When a slight finger pressure is exerted against the upper surface of rule 36 adjacent the center thereof (as indicated by arrow 84), rule 36 flexes slightly so as to pivot about feet 82. This causes rule ends 53 and 55 to be elevated sufficiently above charting sheet 14 so as to enable a person to grasp ends 53 or 55 with his fingers. Thus rule 36 may be lifted from charting sheet 14 much more easily than if feet 82 were not provided.

Operation of the inventive stock market charting apparatus 10 may be understood in conjunction with FIGS. 1, 4 and 5. First, the charting sheet 14 associated with the particular stock being evaluated is placed on base 12, with edge 46 beneath chart guide portion 38a and against spacer edge 44. Charting sheet 14 then is moved horizontally along spacer edge 44 until the particular date block 20' for which data is to be entered is aligned with index mark 48. In the illustration of FIG. 1, this date is July 18, 1969 (i.e., 7-18-69). The numerical date "18" then may be written in block 20'.

Next, the appropriate scale of rule 36 is selected. In the example shown, the price has been plotted using scale 64, that is, using $ scale C. To remind the investor of this fact, charting sheet 14 includes a block 88, identified by a pre-printed dollar sign, in which block the designation C has been entered to identify the price scale used to prepare the chart.

As indicated by the price data 90 already plotted on charting sheet 14, the price of the selected stock has been fluctuating around $35.00. Accordingly, a horizontal line 92 has been drawn on charting sheet 14 and identified along the ordinant with the indication "$35"a. A second horizontal line 94 also has been drawn on charting sheet 14, spaced below line 92 by a distance equal to $5.00 as measured on price scale 64 ($ scale C); line 94 has been identified by the ordinant designation "$30".

Rule 36 is placed atop charting sheet 14, front side up, and with edge 52 abutting against straight edge 34 of rule guide 28. Rule 36 is moved vertically along edge 34 until the $5 index mark 70 of price scale C is aligned with line 92 on charting sheet 14. Next, price information for the specific stock being charted is obtained from a source such as the Wall Street Journal. In the example shown, for the date being plotted the stock price ranged between a low of $31.50 and a high of $33.00, closing at $32.50. To enter this data, a line is drawn using edge 58 as a guide, between the graduations representing 1.5 and 3.0 on price scale 64 (see FIG. 4). Since $5 index mark 70 was aligned with the $35.00 horizontal line 92, the resultant data line segment 96 will represent a price ranging from $31.50 to $33.00. Without moving rule 36, a short horizontal mark may be made opposite the graduation representing 2.5 on scale 64 to indicate the stock closing price of $32.50.

With the apparatus illustrated in FIG. 1, the stock price data 90 for the few days preceding the date for which information is plotted may be seen through opening 50 of scale 36. Thus, the price trend of the stock may be observed while the new price data is being plotted, and without removing scale 36 from charting sheet 14.

Selection of whether $ scale A, B or C is used to plot price data for a particular stock depends on the typical daily price fluctuation of that stock. For example, for a low cost stock, the price may fluctuate less than 1 dollar each day. Use of price scale 60 ($ scale A), which has the largest incremental spacing of the three price scales 60, 62 and 64, permits these small daily price variations to be readily visible on the chart. Conversely, for higher priced stocks which fluctuate by larger dollar amounts daily, price scales 62 or 64 ($ scales B or C) are used to produce the most easily intepretable graphs.

In the preferred embodiment shown in FIGS. 4 and 5, scales 60, 62 and 64 each extend approximately ± $7 from a central $5 graduation. This configuration permits stock price data to be entered without repositioning rule 36 even though the daily price variation may pass a 10 dollar mark. For example, with $5 index mark 70 aligned with $35 line 92 (FIG. 1), any price variation between about $28 and about $42 can be plotted without repositioning rule 36.

To plot volume information for the selected stock for the date aligned with index mark 48, rule 36 is moved along straight edge 34 of rule guide 28 until the bottom edge 53 of rule 36 abuts against the edge 38*b* of charting guide 38. As indicated earlier, the zero index mark of volume scale 76 will be aligned with abcissa 18, and each of the graduations of scale 76 will be in alignment with the corresponding graduation of volume scale 24 printed on charting sheet 14. Another printed block 96 is provided on sheet 14 in which may be entered a designation of which of the two volume scales (0–50 or 0–100) has been used to plot volume information for the selected stock. In the illustration of FIG. 1, previous volume information 98 has been plotted using the 0–50 scale, and the scale identification "50" has been written in block 96.

For the particular date (7-18-69), 2500 shares of the stock were traded. Accordingly, a line is made on charting sheet 14, using edge 58 as a guide, between the "0" and "25" scale graduations on the 0–50 volume scale 76. This new line indicates the present day's sale of 2500 shares, which sales immediately may be compared with the volume data 98 for the preceding days, which data also is visible through opening 50 of rule 36 before rule 36 is removed from the surface of charting sheet 14.

Although not illustrated, if charting sheet 14 had been used to plot an indicator such as "on-balance-volume", "volume price trend" or other data which fluctuates by a plus or minus change value daily, scale 78 (± scale D) of rule 36 (see FIG. 5) would have been used. Since scale 78 has two sets of graduations, a printed block 100 is provided on charting sheet 14 (see FIG. 1) to record which of the scales (± 0–50 or ± 0–100) was used. Further, the ordinant designations 26 would not be in dollars, as when plotting price information, but would be in numerical units related to the particular indicator.

To enter such indicator data, the rear of rule 36 is placed face up atop charting sheet 14, with edge 54 abutting against straight edge 34 of rule guide 28. Zero index mark 80 is horizontally aligned with the last data point (not shown) entered on charting sheet 14, and the new indicator value is entered using rule edge 56 as a guide. Use of ± scale 78 eliminates the need to add or subtract the present day's change in indicator value from the net value for the previous day. In particular, by aligning zero index mark 80 with the previous day's net indicator value, and entering the change directly from scale 78, the resultant mark on charting sheet 14 will be at the correct new indicator value. The previous days indicator activity immediately may be seen through opening 50, without removing rule 36 from charting sheet 14.

Although not illustrated, the stock market charting apparatus 10 of FIG. 1 may be used with a rule which does not have a central opening. Such a rule may be rectangular in shape and have front and rear scales similar to those illustrated in FIGS. 4 and 5, but with the scales provided along the outer edges of the rule. In this case, the perpendicular distance between rule guide straight edge 34 and index mark 48 (see FIG. 1) would be equal to the width of the non-apertured, rectangular rule.

Another embodiment of the inventive stock market charting apparatus is shown in FIGS. 7 and 8, in conjunction with a notebook 106 having binder rings 108. In this embodiment, the rule and chart guides are combined in a unitary member 110 which preferably is constructed of transparent plastic. As described below, member 110 is adapted to engage an edge 112 of a charting sheet 114, which sheet includes holes 116 adapted to be retained by notebook binder rings 108. Unitary member 110 is not attached to notebook 106, however as illustrated, the cover of notebook 106 may be used as a base or support for charting sheet 114 when data is being entered thereon.

Charting sheet 114 is similar to charting sheet 14 of FIG. 1, including an abcissa 118 provided with boxes 120 for the entry of dates, and an ordinant 122 provided with a pair of volume scales 124 and a region 26 for entering price or other ordinant scale information. Charting sheet 114 includes three printed blocks 130, 132 and 134, analogous to blocks 88, 96 and 100 of charting sheet 14, for the entry of $, V and ± scale information. Charting sheet 114 also is provided with a region 136 in which various data relating to the stock being plotted may be entered. For example, data region 136 may include a stock transaction history for entry of the dates on which various shares of the selected stock were traded by the investor. Similary, data region 136 may be used to record sales, earnings, dividends and other financial data related to the company whose stock history is being plotted.

Referring still to FIGS. 7 and 8, unitary member 110 itself includes a planar, substantially rectangular portion 140 having a width somewhat larger than the width of rule 36. An elongate edge portion 142 of member 110 is folded forward to form a lip which functions as a rule guide. Thus, the interior edge 144 of folded portion 142 functions analogously to straight edge 34 of rule guide 28 in the embodiment of FIG. 1. The bottom end of member 110 is folded backward to form a lip 146. In the embodiment illustrated, lip 146 is semi-circular, thereby facilitating insertion of the lip behind charting sheet 114.

Note that the interior bottom edge 148 of member 110 is perpendicular to edge 144, and engages the bottom edge 112 of charting sheet 114. This insures that straight edge 144 is perpendicular to abcissa 118, so that when an edge of rule 36 abuts against edge 144, data plotted using an elongate edge of rule 36 as a guide will be entered parallel to ordinant 122. In this regard, note that unitary member 110 is provided with an elongate central opening 150, the central axis of which is parallel to edge 144 and coincident with an index mark 152 provided on planar portion 140 of member 110. Data is entered on charting sheet 114 through opening 150.

Index mark 152 is analogous to index mark 48 in the embodiment of FIG. 1. That is, the perpendicular spacing between straight edge 144 and index mark 152 is identical to the spacing between straight edge 34 and index mark 48 (see FIG. 1). Thus, if unitary member 110 is designed for use with rule 36 (FIGS. 4 and 5), the perpendicular distance between straight edge 144 and index mark 152 is equal to one-half the width of rule 36 plus one-half the width of central opening 50 of rule 36.

It should be apparent that when rule 36 is placed atop planar member 140, with an elongate edge 52 or 54 abutting against straight edge 144, an interior elongate edge 56 or 58 will be aligned with index mark 152, so that data can be entered on charting sheet 114 using this interior edge 56 or 58 as a guide. Because of the spacing involved, the guide edge will be situated along the central axis of opening 150.

Unitary member 110 also is provided adjacent its lower end with a strip member 154 which functions as a rule stop. Rule stop 154 has an upper edge 156 which is parallel to edge 148 and situated so that when an end 53 or 55 or rule 36 abuts against edge 156, the zero index mark of one of the volume scales 72, 74 or 76 will coincide with abcissa 118. Thus, edge 156 of rule stop 154 functions analogously to edge 38b of charg guide 38 of the embodiment of FIG. 1.

Operation of the unitary charting apparatus 110 illustrated in FIGS. 7 and 8 is similar to that of the embodiment of FIG. 1. Initially, the lower edge of 112 of charting sheet 114 is inserted between planar member 140 and the rearwardly folded lip 146, with the sheet edge 112 abutting against interior edge 148 of member 110. Unitary member 110 then is moved horizontally with respect to charting sheet 114 until index mark 152 is aligned with the box 120' corresponding to the date for which stock market data is to be plotted. Since member 110 is moveable, charting sheet 114 may remain attached to notebook 106 by means of rings 108 as shown in FIG. 7.

Since price scale B has been used to plot the previous price data on sheet 114 (as indicated by the B written in block 130), rule 36 is placed atop planar member 140 with the rear side facing upward, and with elongate edge 52 abutting against straight edge 144. In this instance, the elongate interior edge 58 adjacent price scale B will be aligned along the axis of central opening 150 of member 110, in line with index mark 152. Elongate rule edge 58 then may be used as a guide for

plotting price data on charting sheet 114. Note that the pencil or pen (not shown) used to enter the data will project through opening 150 to enable marking of sheet 114.

For entering volume information, rule 36 is positioned atop planar member 140 (FIG. 7) with an elongate edge 52 or 54 abutting against straight edge 144 and with end 53 or 55 abutting against edge 156 of rule stop 154. In this position the zero index of the selected volume scale 72, 74 or 76 will be aligned with abcissa 118, so that the graduations of the volume scales will coincide with the corresponding graduations of the volume scales 124 printed on charting sheet 114. Again, data is entered using edge 56 or 58 as a guide and with the marking pencil or pen extending through opening 150 in member 110.

Although not illustrated, the amount of space available for entry of data on charting sheet 14 or 114 may be increased by the use of an overlay chart or an overlapping chart extension. Such a extension may comprise a charting sheet the left-hand edge of which is not provided with an ordinant scale, but which overlaps, and is attached to the right-hand edge of sheet 14 or 114. Thus the chart extension increases the width of the sheet 14 or 114, permitting the stock price, volume or other indicator history to be plotted on a single extended chart covering a period of many months or years.

While the invention has been described with respect to several physical embodiments constructed in accordance therewith, it will be apparent to those skilled in the art that various modifications and improvements may be made without departing from the scope and spirit of the invention.

I claim:

1. Apparatus for plotting data on a charting sheet, comprising:

a planar base,

a substantially rectangular rule having a scale adjacent one elongate edge thereof,

a substantially planar rule guide having a straight edge, said charting sheet being positionable beneath said rule guide, said rule guide comprising:

first spacer means, and a generally rectuangular planar member, one elongate edge of said planar member comprising said straight edge, one end of said planar member being fixedly attached to said base and separated therefrom by said first spacer means,

chart guide means cooperating with said rule guide for retaining the abscissa of said charting sheet in perpendicular alignment with said rule guide straight edge, said chart guide means having an index mark spaced from said straight edge by a distance equal to the spacing between said one elongate edge and another elongate edge of said rule, whereby when said other elongate edge of said rule is placed against said straight edge, said one elongate edge is perpendicular to said abscissa and aligned with said index mark, and wherein said chart guide means comprises:

second spacer means, and

a strip member including said index mark, said strip member being fixedly attached to said base and separated therefrom by said second spacer means whereby when an edge of said charting sheet is disposed beneath a portion of said strip member and against one of said spacer means, the abscissa of said charting sheet is aligned perpendicular to said straight edge.

2. Apparatus according to claim 1 wherein said rule includes a central rectangular opening, the elongate edges of said opening being parallel to and equally spaced from the respective exterior elongate edges of said rule, said rule further including a plurality of scales of different incremental spacing, said scales being adjacent the elongate edges of said opening.

3. Apparatus according to claim 2 wherein said index mark is spaced from said straight edge by a distance equal to half the width of said rule plus half the width of said opening.

4. Apparatus according to claim 1 wherein each of said first and second spacer means has a thickness slightly greater than the thickness of said charting sheet, and wherein said strip member is attached substantially perpendicular to said straight edge and in alignment with said one end of said planar member, whereby when said charting sheet is disposed beneath said strip member and against said second spacer means, said data sheet may be moved freely parallel to the abcissa, a portion of the charting sheet being disposable beneath said planar member.

5. Apparatus according to claim 4 wherein said planar member and said strip member each comprise transparent plastic, and wherein said base comprises the cover of a notebook.

6. Apparatus for plotting stock market data on a chart having an abscissa scale and an arbitrary ordinate scale, said apparatus comprising:

a planar, substantially rectangular base,

a rule guide attached to said base,

chart guide means attached to said base for maintaining the abscissa of said chart perpendicular to a first edge of said rule guide, said chart being positionable parallel to said abscissa and beneath said rule guide,

a rule having along one elongate edge at least one scale including major graduations identified by consecutive units digits and having a fiducial mark associated with a particular one of said graduations, said rule being positionable above said chart against said rule guide first edge with said one scale parallel to the chart ordinate and with said fiducial mark aligned with a point on said ordinate having the same units value as said particular one of said graduations, and

wherein said chart guide means has an index mark spaced from said rule guide first edge by a distance equal to the spacing between said rule one edge and another elongate edge of said rule, whereby when said other elongate edge of said rule is placed against said rule guide first edge, said rule one edge is perpendicular to said abscissa and aligned with said index mark.

7. Apparatus as defined in claim 6 wherein said rule includes a plurality of scales of different incremental spacing, each scale being adjacent a different elongate edge of said rule.

8. Apparatus as defined in claim 7 wherein said rule includes a central rectangular opening, the elongate edges of said opening being parallel to the outer elongate edges of said rule, said scales being adjacent the elongate edges of said opening.

9. Apparatus as defined in claim 7 wherein scales are included on both front and rear surfaces of said rule.

10. Apparatus as defined in claim 7 wherein said rule is flexible, said rule including one or more thin raised feet projecting from the surface thereof and adapted to rest on said charting sheet, whereby pressure applied to the upper surface of said rule will cause said rule to pivot about said feet so as to facilitate lifting of said rule from said charting sheet.

11. apparatus according to claim 6 wherein said one scale has approximately fifteen major graduations, said fiducial mark being associated with the central one of said major graduations.

12. Apparatus according to claim 6 wherein said fiducial mark is associated with the units digit "5" major graduation, and wherein each of said major graduations is divided into fractional graduations.

13. Apparatus for plotting stock market data on a chart having an abscissa scale and an arbitrary ordinate scale, said apparatus comprising:

a planar, substantially rectangular base,

a rule guide attached to said base,

chart guide means attached to said base for maintaining the abscissa of said chart perpendicular to a first edge of said rule guide, said chart being positionable parallel to said abscissa and beneath said rule guide, and

a rule having along one edge at least one scale including major graduations identified by consecutive units digits and having a fiducial mark associated with a particular one of said graduations, said rule being positionable above said chart against said rule guide first edge with said one scale parallel to the chart ordinate and with said fiducial mark aligned with a point on said ordinate having the same units value as said particular one of said graduations.

14. Apparatus for plotting stock market data on a chart having abscissa and ordinate scales, said apparatus comprising:

a planar, substantially rectangular base,

a rule guide attached to said base,

a rule having first and second elongate edges,

chart guide means attached to said base for maintaining the abscissa of said chart perpendicular to a first edge of said rule guide, said chart being positionable parallel to said abscissa and beneath said rule guide, said chart guide means having an index mark spaced from said rule guide first edge by a distance equal to the spacing between said first and second elongate edges of said rule,

said rule having along said second elongate edge a scale including two sets of graduations extending in opposite directions from a central zero fiducial mark, whereby when said first elongate edge of said rule is placed against said rule guide first edge, said rule scale is perpendicular to said abscissa and aligned with said index mark, said rule being positionable parallel to said rule guide first edge to align said central zero fiducial mark with a previously plotted mark on said chart, said rule scale thereby facilitating entry on said chart of changes in the plotted parameter.

15. Apparatus for plotting stock market data on a chart having an abscissa scale and an ordinate volume scale extending upwardly from a zero point aligned with said abscissa scale, said apparatus comprising:

a planar, substantially rectangular base,

a rule guide attached to said base,

a rule having first and second elongate edges and a bottom edge perpendicular to said elongate edges,

chart guide means attached to said base for maintaining the abscissa of said chart perpendicular to a first edge of said rule guide, said chart being positionable parallel to said abscissa and beneath said rule guide, said chart guide means having an index mark spaced from said rule guide first edge by a distance equal to the spacing between said first and second elongate edges of said rule,

a rule having along said second elongate edge a volume scale corresponding to said ordinate volume scale and positioned so that when said rule bottom edge is placed in abutting relationship with said chart guide means, said rule volume scale will be in horizontal alignment with said chart ordinate volume scale, and when said first elongate edge of said rule is placed against said rule guide first edge, said rule second elongate edge will be parallel to said abscissa and aligned with said index mark.

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United States Patent [19]

Hill

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[45] Date of Patent: Jun. 2, 1998

[54] **METHOD FOR UPDATING A REMOTE COMPUTER**

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[73] Assignee: **Charles E. Hill & Associates, Inc.**, Indianapolis, Ind.

[21] Appl. No.: **460,913**

[22] Filed: **Jun. 5, 1995**

Related U.S. Application Data

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[51] **Int. Cl.**[6] **G06F 17/60**

[52] **U.S. Cl.** **705/27**; 705/26; 707/530; 707/540; 707/104

[58] **Field of Search** 364/401, 406, 364/408, 200.75; 379/90, 98, 90.01, 93.12; 395/155, 425, 650, 600, 226, 227, 601, 712, 701; 380/4, 25, 30; 283/50; 707/530, 539, 540, 902, 100, 104; 705/26, 27

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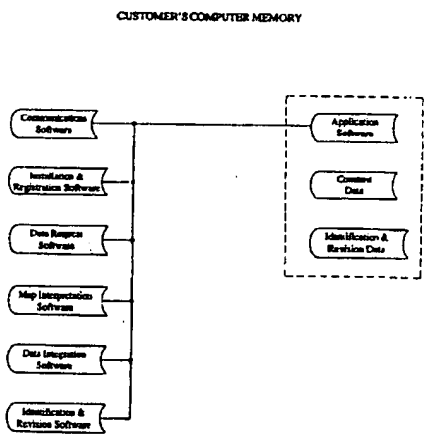
[57] **ABSTRACT**

A method for accessing product information data includes storing product data including graphics data and textual data related to a plurality of products in a memory of a main computer, storing a first subset of product data including graphics data related to at least one product in a memory of the remote computer, and transmitting a data request query related to a selected product from the remote computer to the main computer. The method also includes identifying a second subset of product data related to the selected product stored in the memory of the main computer based on the data request query; transmitting textual data from second subset of product data from the main computer to the remote computer, transmitting only updated graphics data from the main computer to the remote computer, storing the updated graphics data in the memory of the remote computer, and combining the textual data received from the main computer with graphics data stored in the memory of the remote computer to provide complete product information data related to the selected product.

20 Claims, 19 Drawing Sheets



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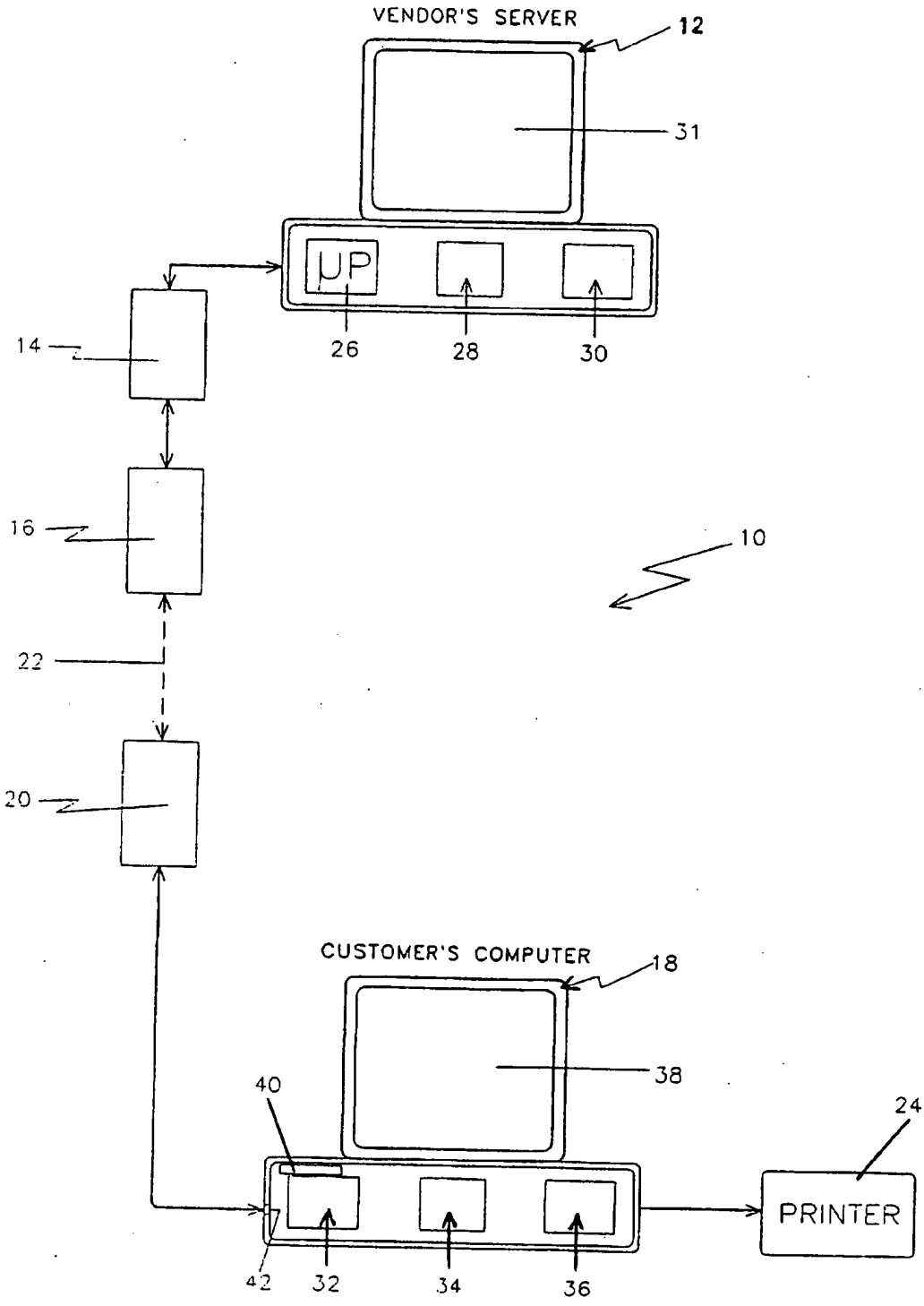

VENDOR'S SERVER
12
31
μP
26
28
30
14
16
10
22
20
CUSTOMER'S COMPUTER
18
38
40
24
PRINTER
42
32
34
36

FIG. 1A

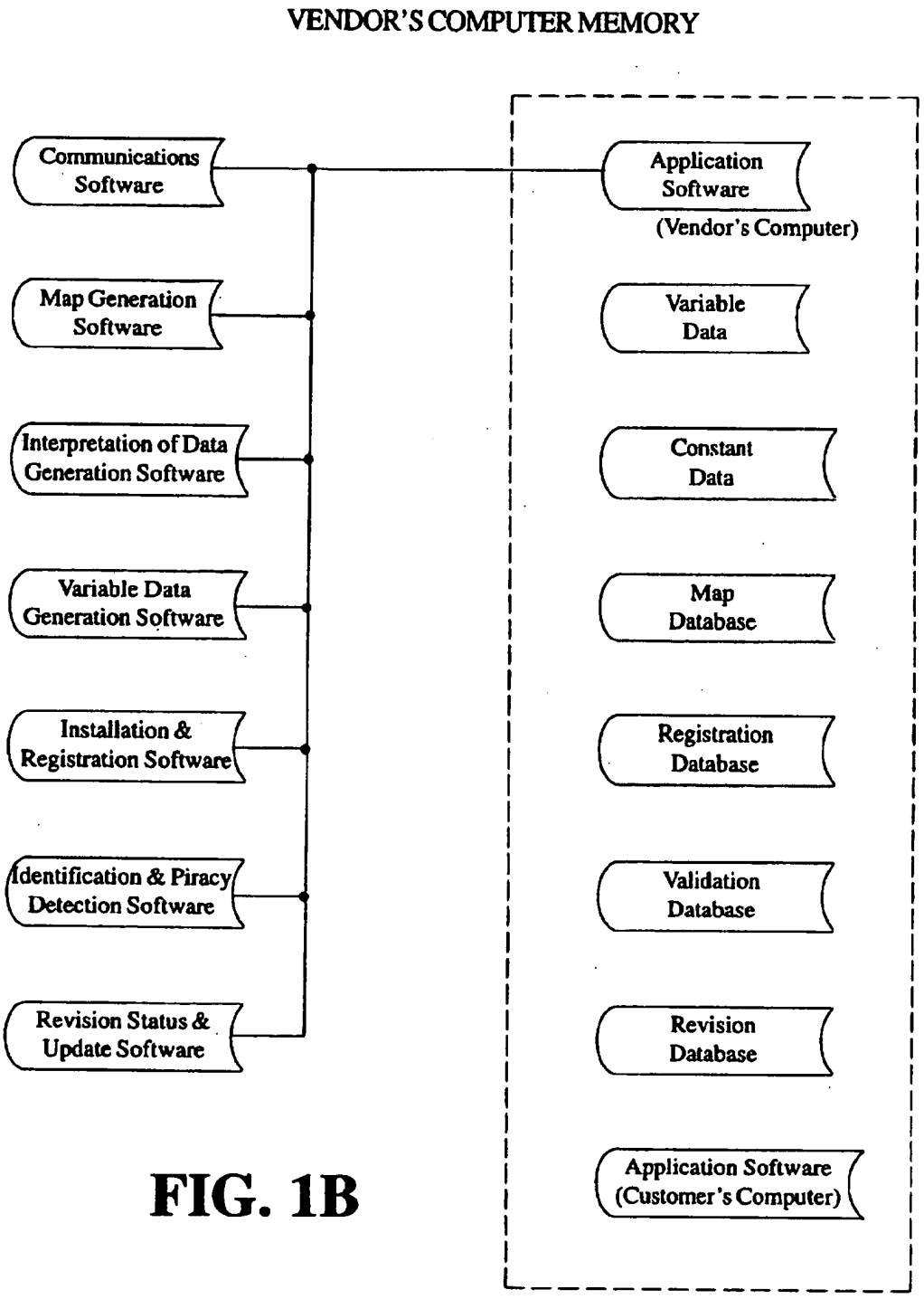

VENDOR'S COMPUTER MEMORY
Communications Software
Map Generation Software
Interpretation of Data Generation Software
Variable Data Generation Software
Installation & Registration Software
Identification & Piracy Detection Software
Revision Status & Update Software
Application Software
(Vendor's Computer)
Variable Data
Constant Data
Map Database
Registration Database
Validation Database
Revision Database
Application Software (Customer's Computer)

FIG. 1B

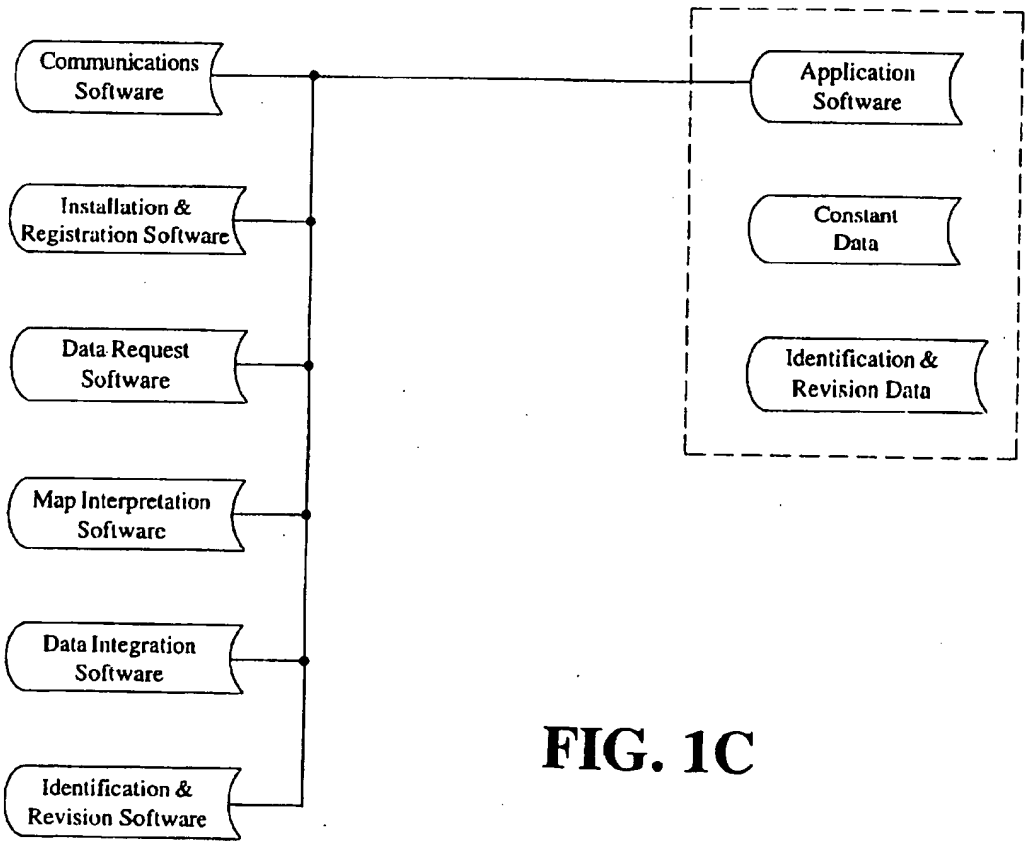

CUSTOMER'S COMPUTER MEMORY
Communications Software
Installation & Registration Software
Data Request Software
Map Interpretation Software
Data Integration Software
Identification & Revision Software
Application Software
Constant Data
Identification & Revision Data

FIG. 1C

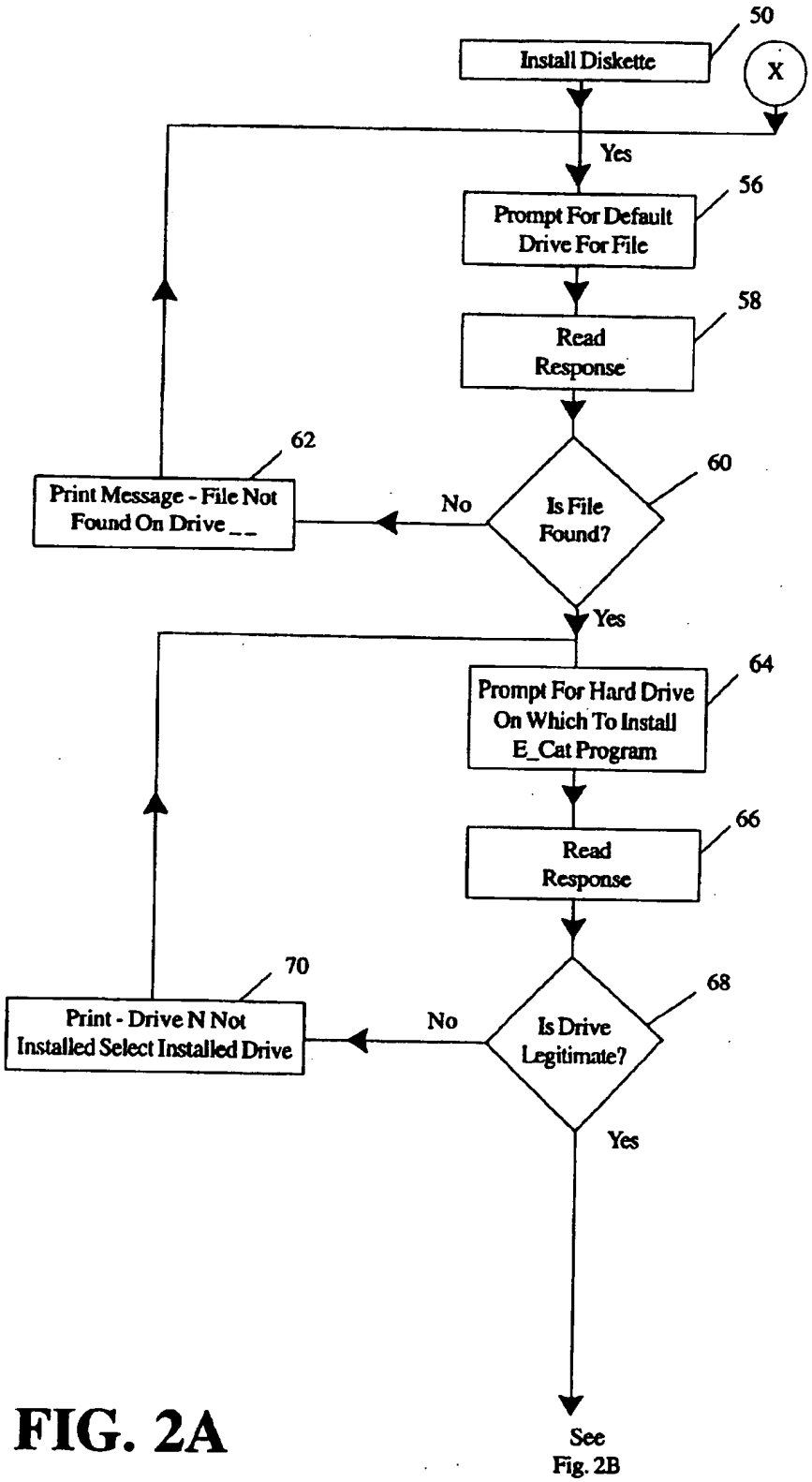

50
Install Diskette
X
Yes
56
Prompt For Default Drive For File
58
Read Response
62
Print Message - File Not Found On Drive __
No
Is File Found?
60
Yes
64
Prompt For Hard Drive On Which To Install E_Cat Program
66
Read Response
70
Print - Drive N Not Installed Select Installed Drive
No
Is Drive Legitimate?
68
Yes
See Fig. 2B

FIG. 2A

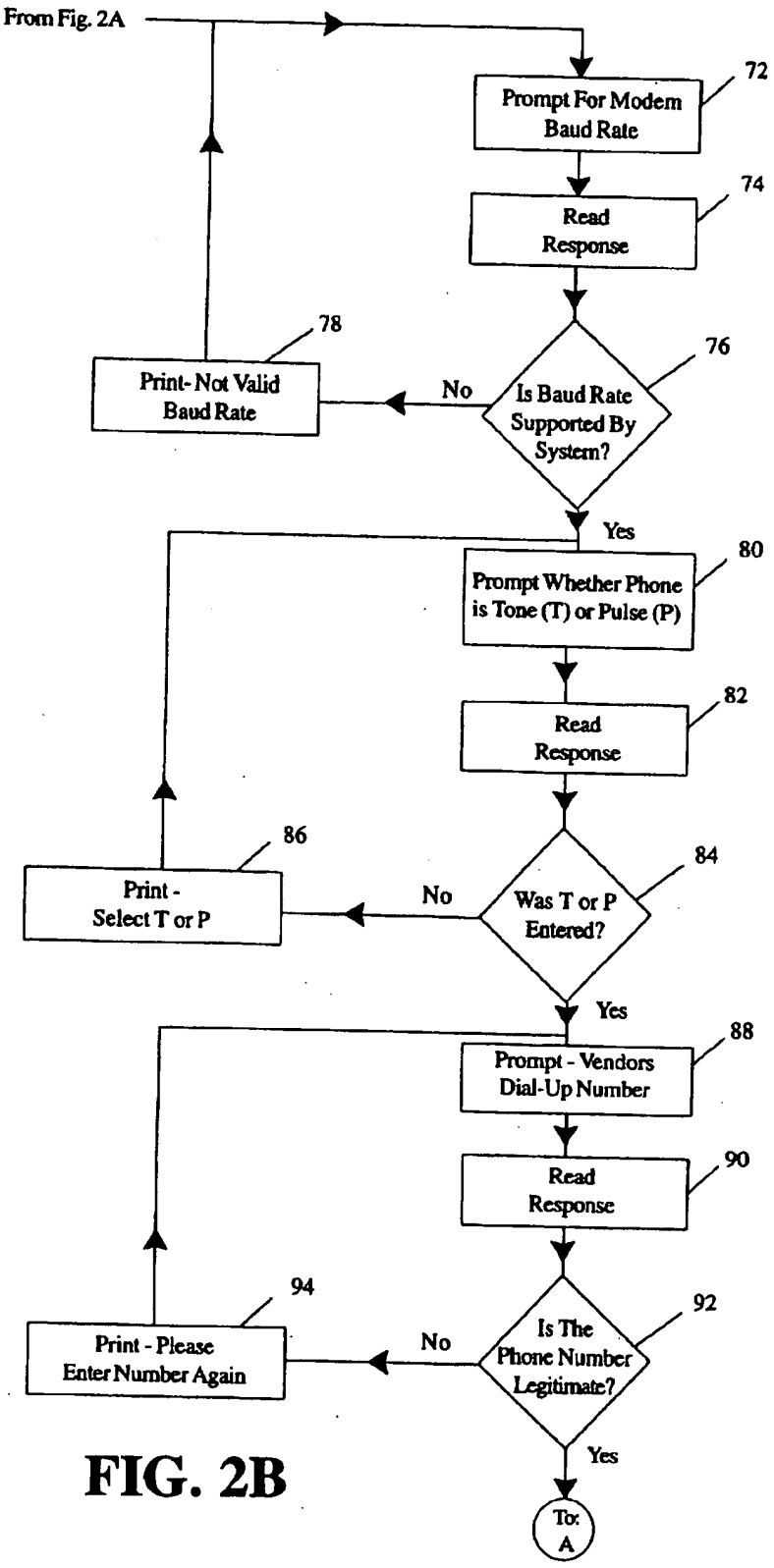

From Fig. 2A
Prompt For Modem Baud Rate
72
Read Response
74
Is Baud Rate Supported By System?
76
No
Print- Not Valid Baud Rate
78
Yes
Prompt Whether Phone is Tone (T) or Pulse (P)
80
Read Response
82
Was T or P Entered?
84
No
Print - Select T or P
86
Yes
Prompt - Vendors Dial-Up Number
88
Read Response
90
Is The Phone Number Legitimate?
92
No
Print - Please Enter Number Again
94
Yes
To A

FIG. 2B

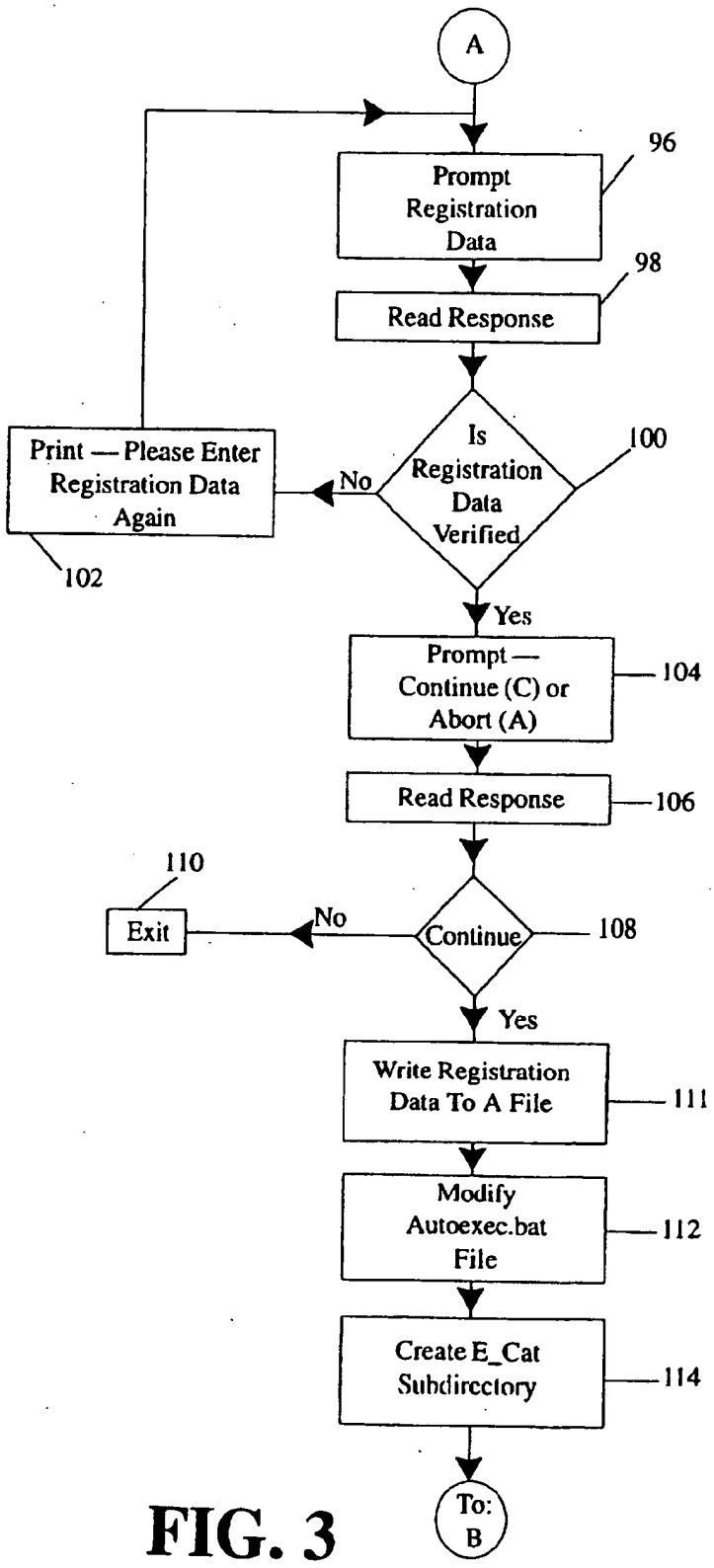

A
Prompt Registration Data
96
Read Response
98
Is Registration Data Verified
100
No
Print — Please Enter Registration Data Again
102
Yes
Prompt — Continue (C) or Abort (A)
104
Read Response
106
Continue
108
No
Exit
110
Yes
Write Registration Data To A File
111
Modify Autoexec.bat File
112
Create E_Cat Subdirectory
114
To: B

FIG. 3

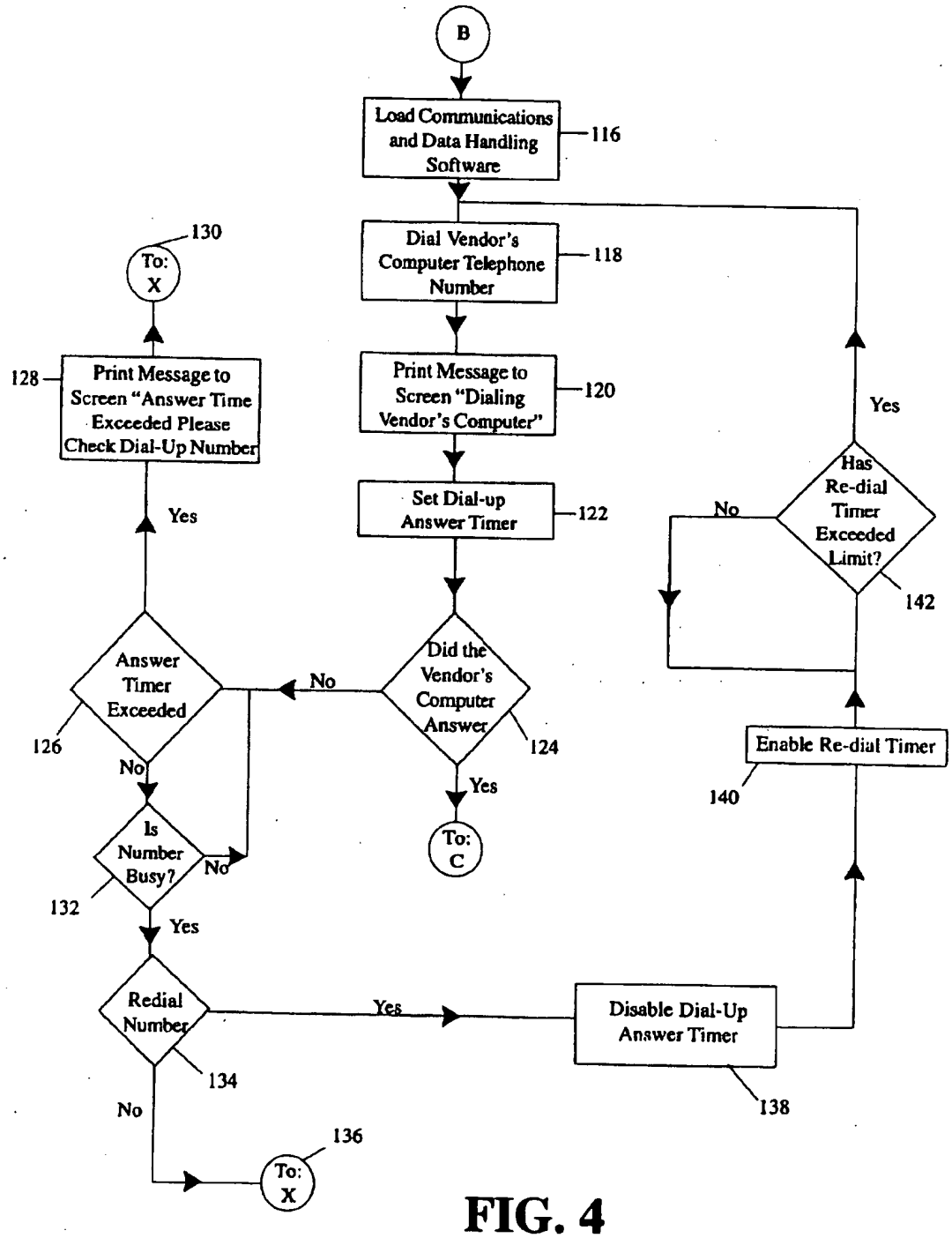

B
Load Communications and Data Handling Software
116
Dial Vendor's Computer Telephone Number
118
Print Message to Screen "Dialing Vendor's Computer"
120
Set Dial-up Answer Timer
122
Did the Vendor's Computer Answer
124
Yes
To: C
No
Answer Timer Exceeded
126
No
Is Number Busy?
132
No
Yes
Redial Number
134
Yes
Disable Dial-Up Answer Timer
138
No
To: X
136
To: X
130
Print Message to Screen "Answer Time Exceeded Please Check Dial-Up Number
128
Yes
Has Re-dial Timer Exceeded Limit?
142
No
Yes
Enable Re-dial Timer
140

FIG. 4

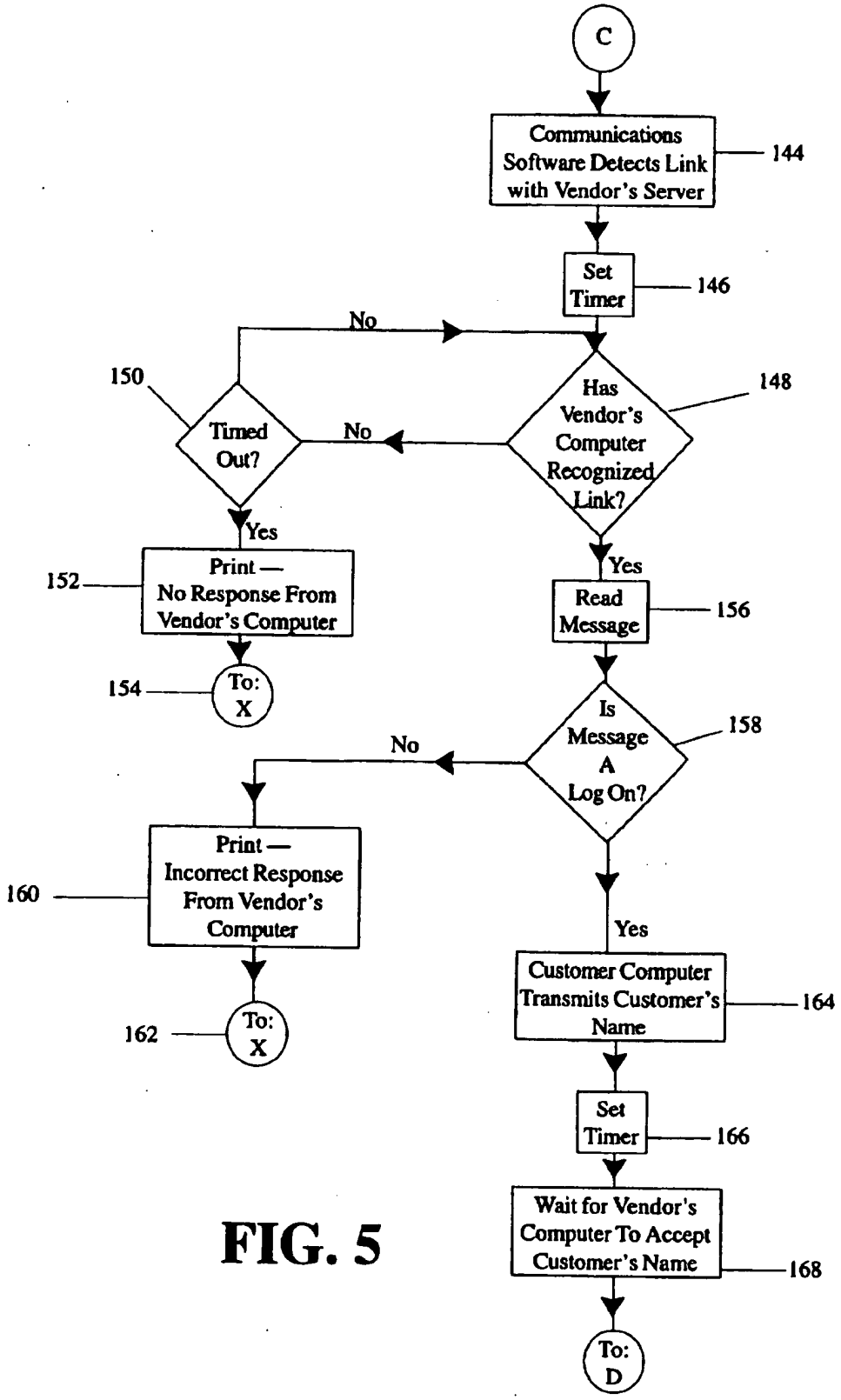

C
Communications Software Detects Link with Vendor's Server
144
Set Timer
146
No
150
Timed Out?
No
Has Vendor's Computer Recognized Link?
148
Yes
Yes
Print — No Response From Vendor's Computer
152
Read Message
156
154
To: X
Is Message A Log On?
158
No
Print — Incorrect Response From Vendor's Computer
160
Yes
Customer Computer Transmits Customer's Name
164
162
To: X
Set Timer
166
Wait for Vendor's Computer To Accept Customer's Name
168
To: D

FIG. 5

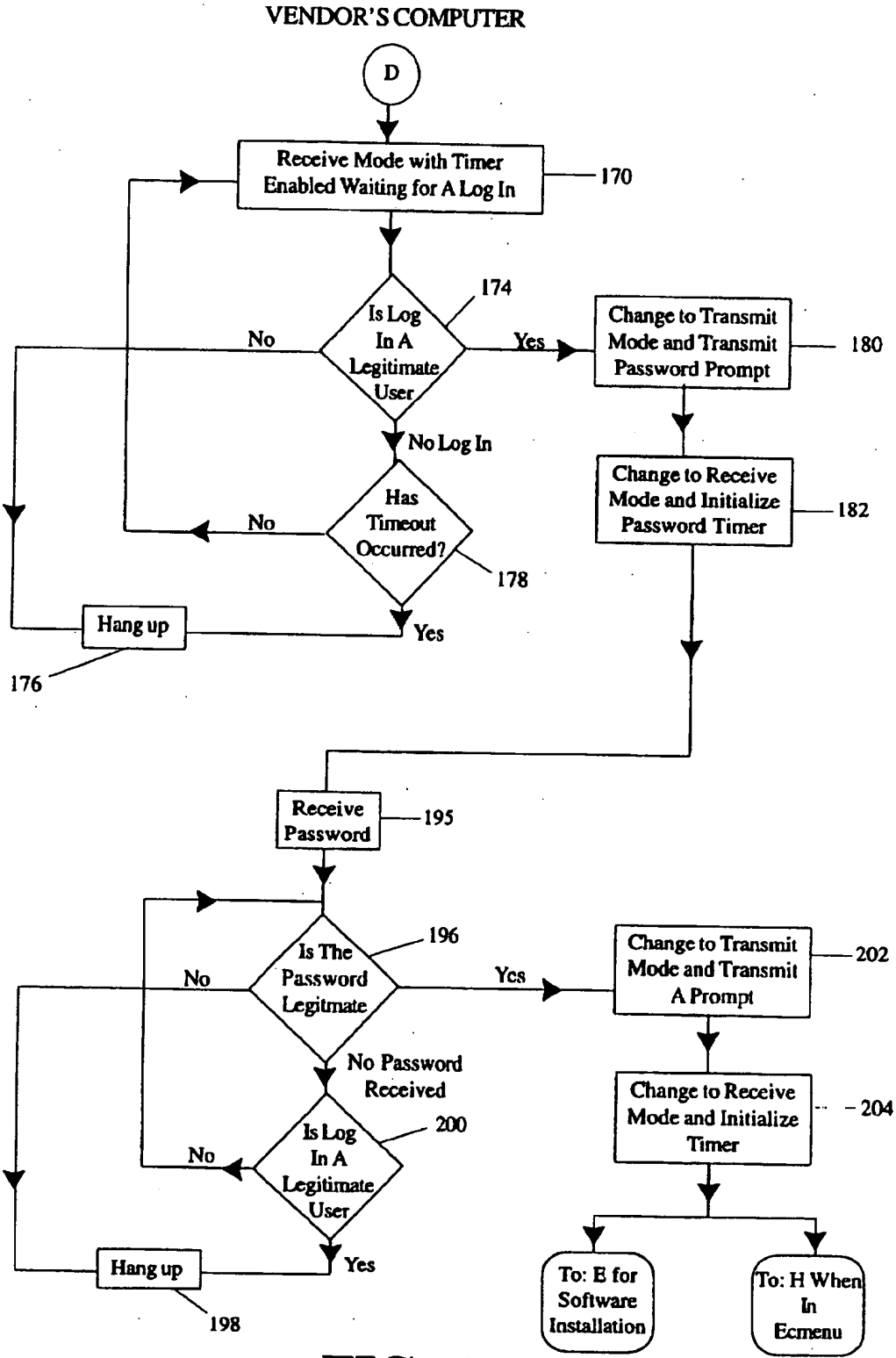

VENDOR'S COMPUTER
D
Receive Mode with Timer Enabled Waiting for A Log In
170
Is Log In A Legitimate User
174
No
Yes
Change to Transmit Mode and Transmit Password Prompt
180
No Log In
Has Timeout Occurred?
178
No
Change to Receive Mode and Initialize Password Timer
182
Hang up
176
Yes
Receive Password
195
Is The Password Legitmate
196
No
Yes
Change to Transmit Mode and Transmit A Prompt
202
No Password Received
Is Log In A Legitimate User
200
No
Change to Receive Mode and Initialize Timer
204
Hang up
198
Yes
To: E for Software Installation
To: H When In Ecmenu

FIG. 6A

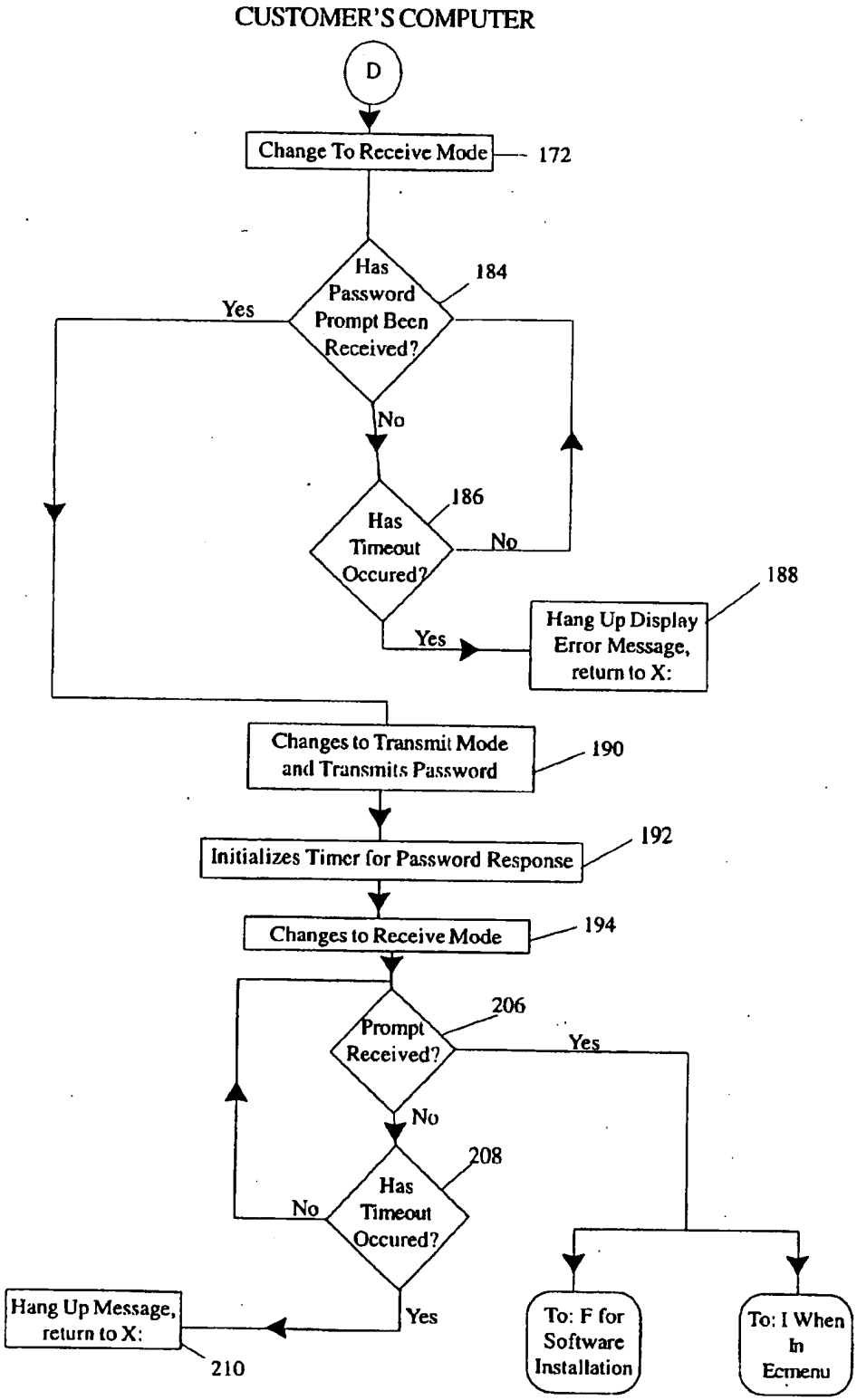

CUSTOMER'S COMPUTER
D
Change To Receive Mode
172
Has Password Prompt Been Received?
184
Yes
No
Has Timeout Occured?
186
No
Yes
Hang Up Display Error Message, return to X:
188
Changes to Transmit Mode and Transmits Password
190
Initializes Timer for Password Response
192
Changes to Receive Mode
194
Prompt Received?
206
Yes
No
Has Timeout Occured?
208
No
Yes
Hang Up Message, return to X:
210
To: F for Software Installation
To: I When In Ecmenu

FIG. 6B

VENDOR'S COMPUTER

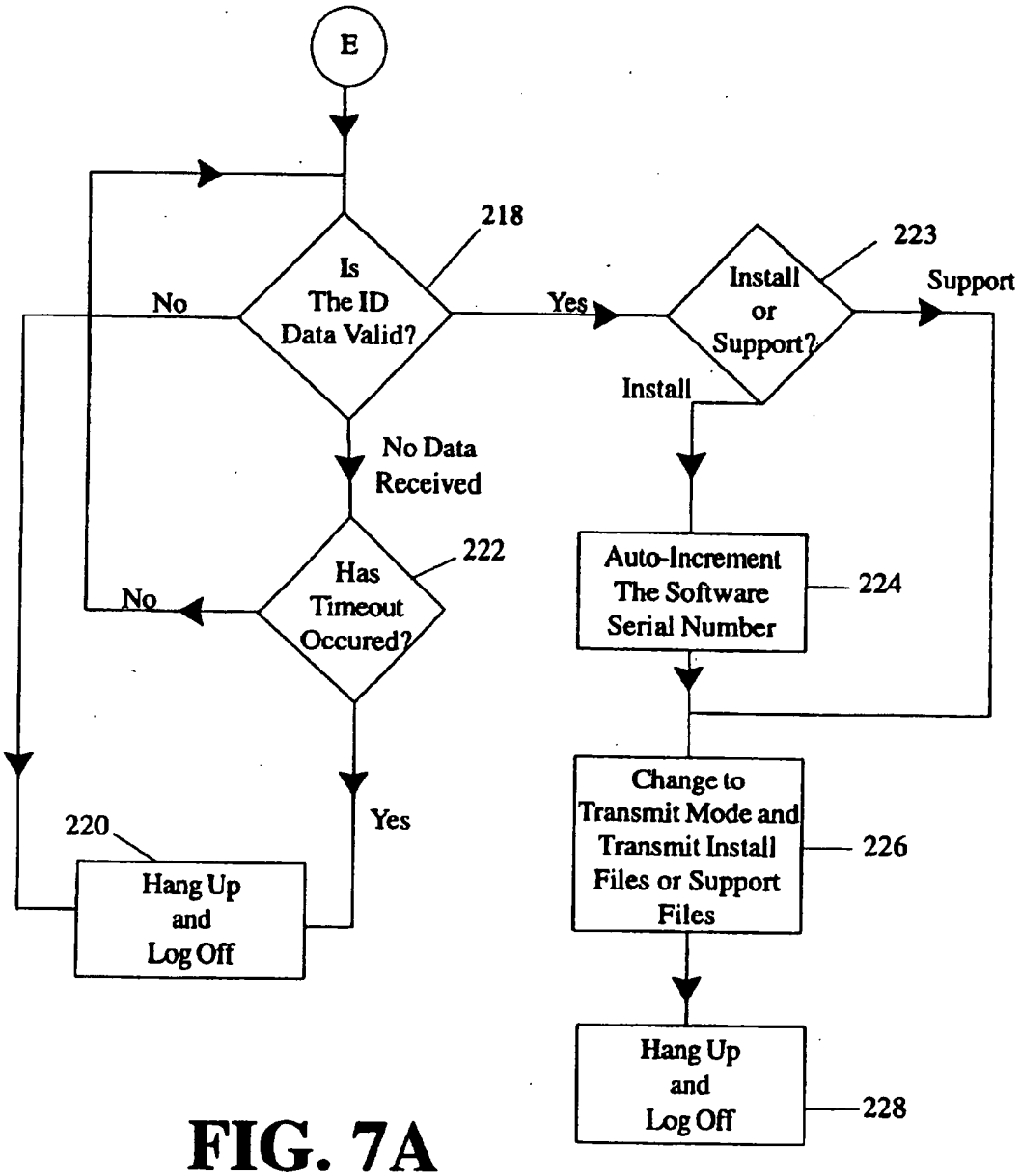


FIG. 7A

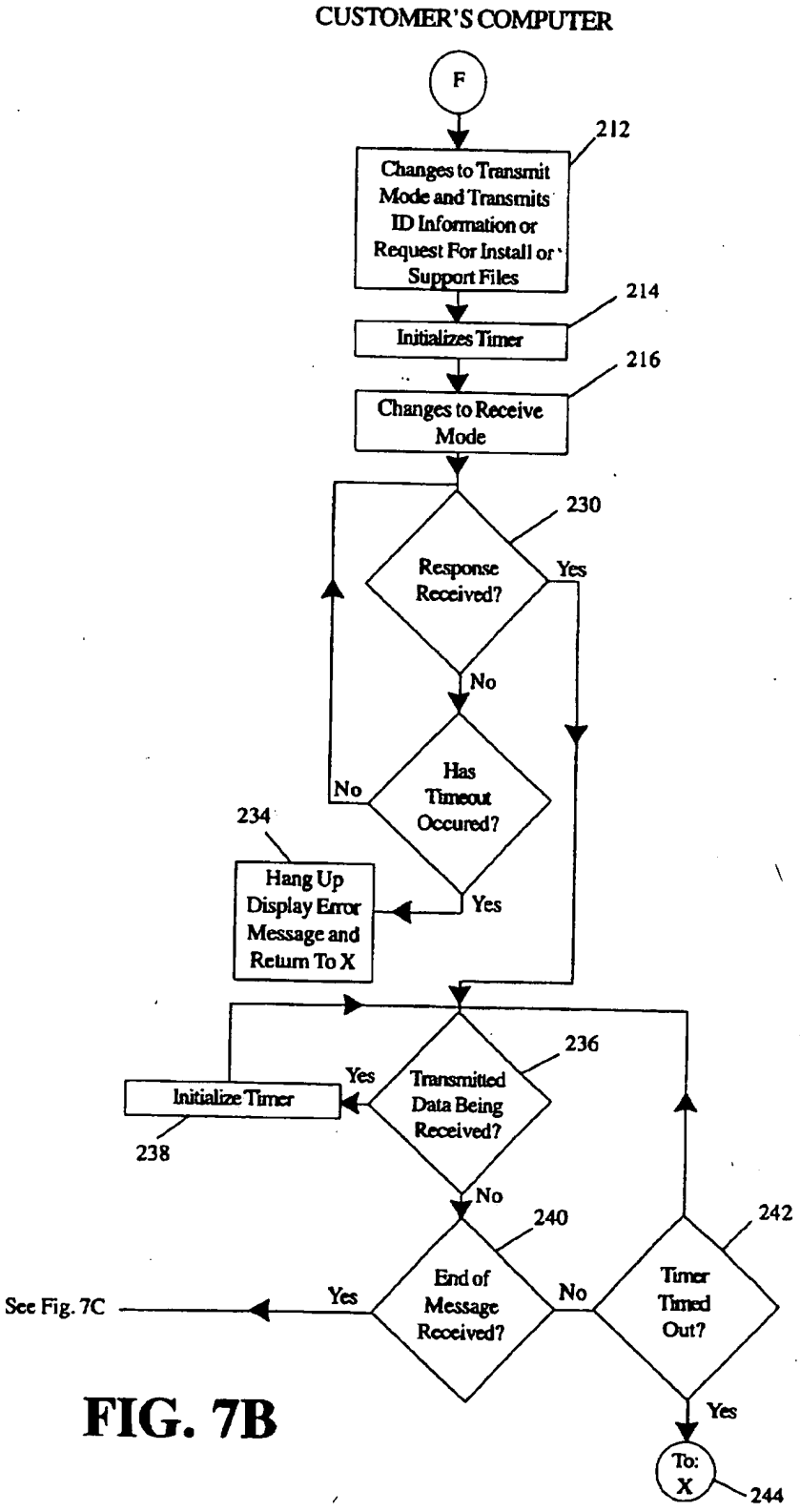

CUSTOMER'S COMPUTER
F
212
Changes to Transmit Mode and Transmits ID Information or Request For Install or Support Files
214
Initializes Timer
216
Changes to Receive Mode
230
Response Received?
Yes
No
Has Timeout Occured?
No
234
Hang Up Display Error Message and Return To X
Yes
236
Transmitted Data Being Received?
Yes
Initialize Timer
238
No
240
End of Message Received?
Yes
See Fig. 7C
No
242
Timer Timed Out?
Yes
To: X
244

FIG. 7B

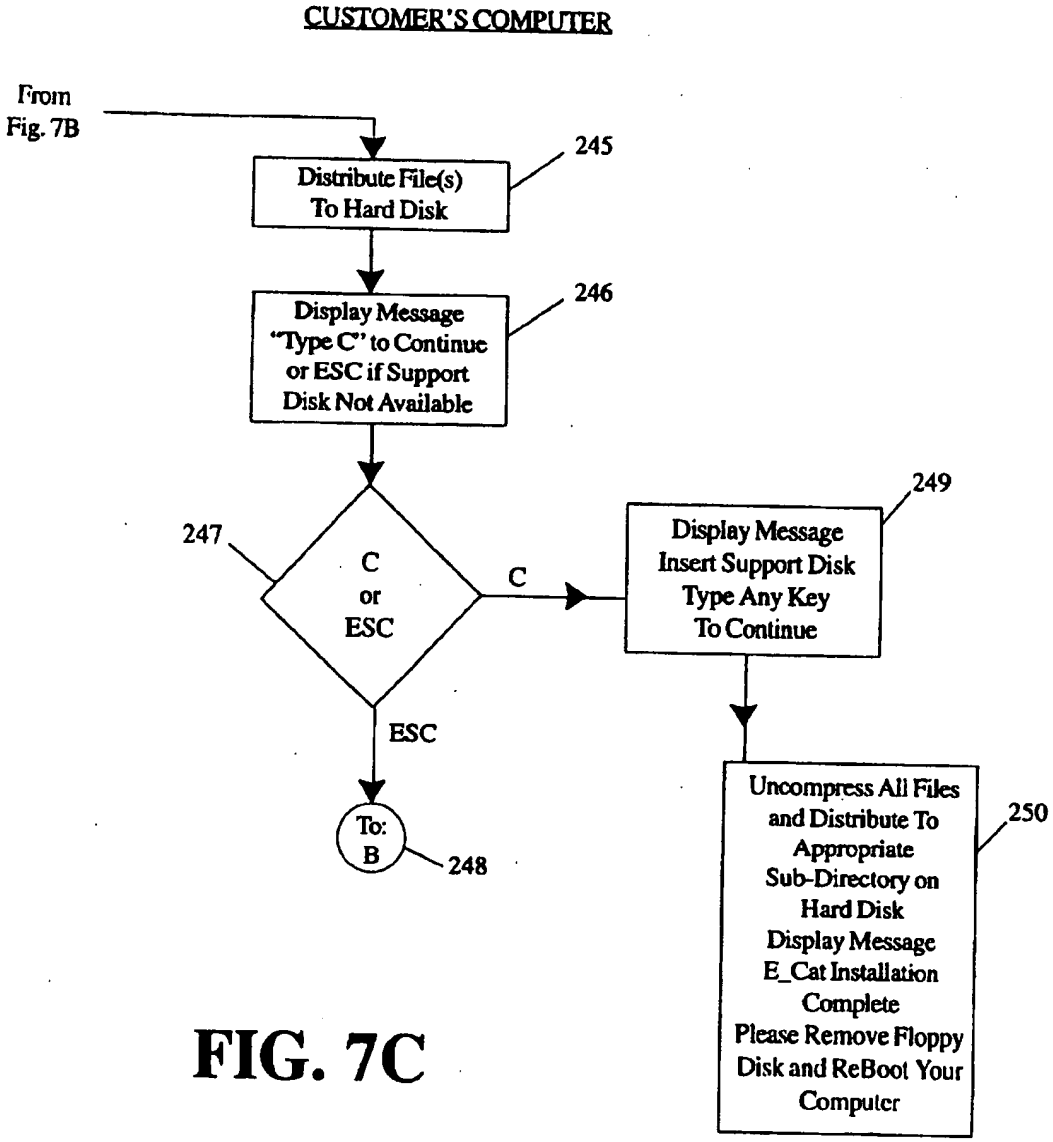

CUSTOMER'S COMPUTER
From Fig. 7B
Distribute File(s) To Hard Disk
245
Display Message "Type C" to Continue or ESC if Support Disk Not Available
246
247
C or ESC
C
Display Message Insert Support Disk Type Any Key To Continue
249
ESC
To: B
248
Uncompress All Files and Distribute To Appropriate Sub-Directory on Hard Disk Display Message E_Cat Installation Complete Please Remove Floppy Disk and ReBoot Your Computer
250

FIG. 7C

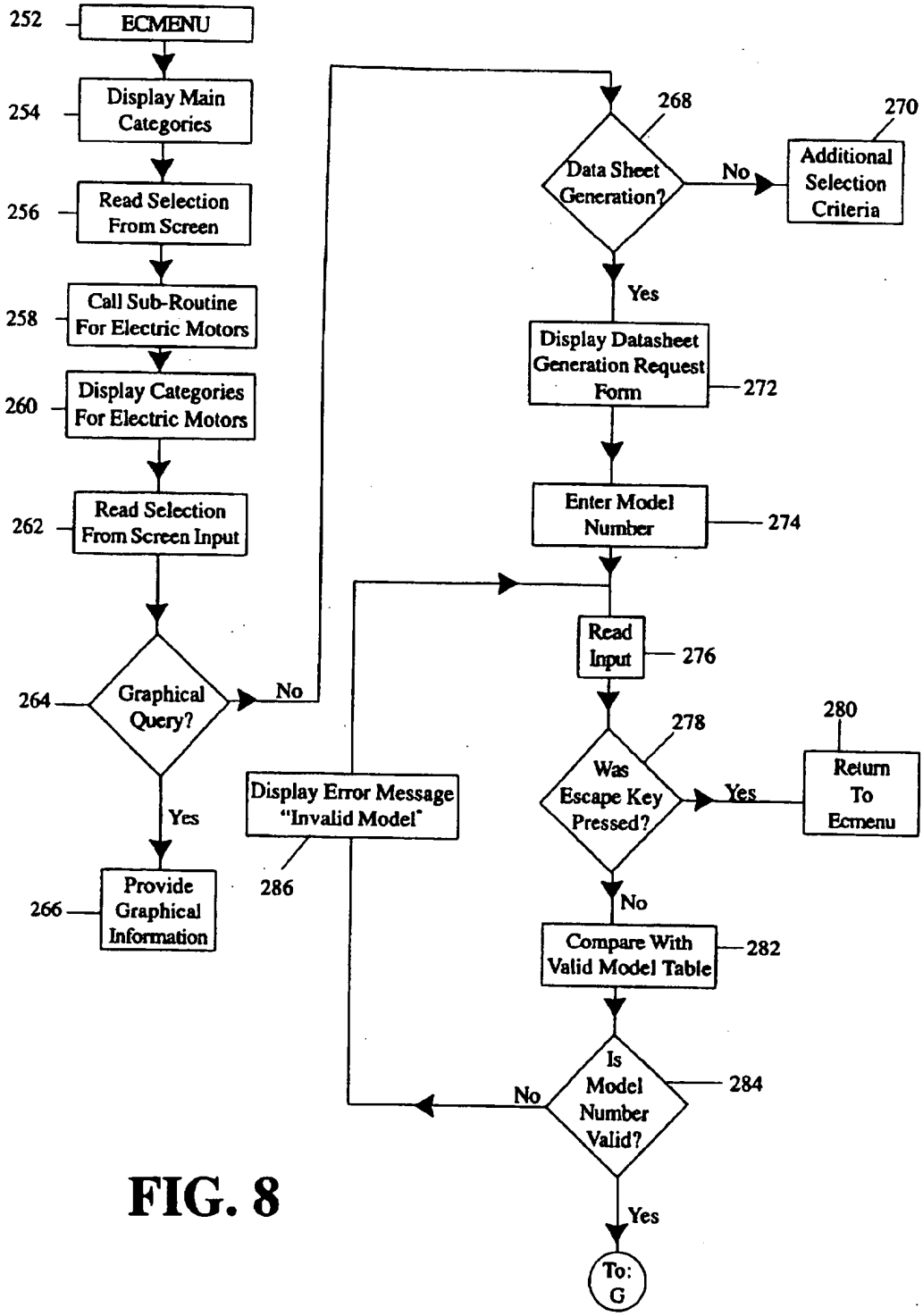

252
ECMENU
254
Display Main Categories
256
Read Selection From Screen
258
Call Sub-Routine For Electric Motors
260
Display Categories For Electric Motors
262
Read Selection From Screen Input
264
Graphical Query?
No
Yes
266
Provide Graphical Information
Display Error Message "Invalid Model"
286
268
Data Sheet Generation?
No
270
Additional Selection Criteria
Yes
Display Datasheet Generation Request Form
272
Enter Model Number
274
Read Input
276
278
Was Escape Key Pressed?
Yes
280
Return To Ecmenu
No
Compare With Valid Model Table
282
Is Model Number Valid?
284
No
Yes
To: G

FIG. 8

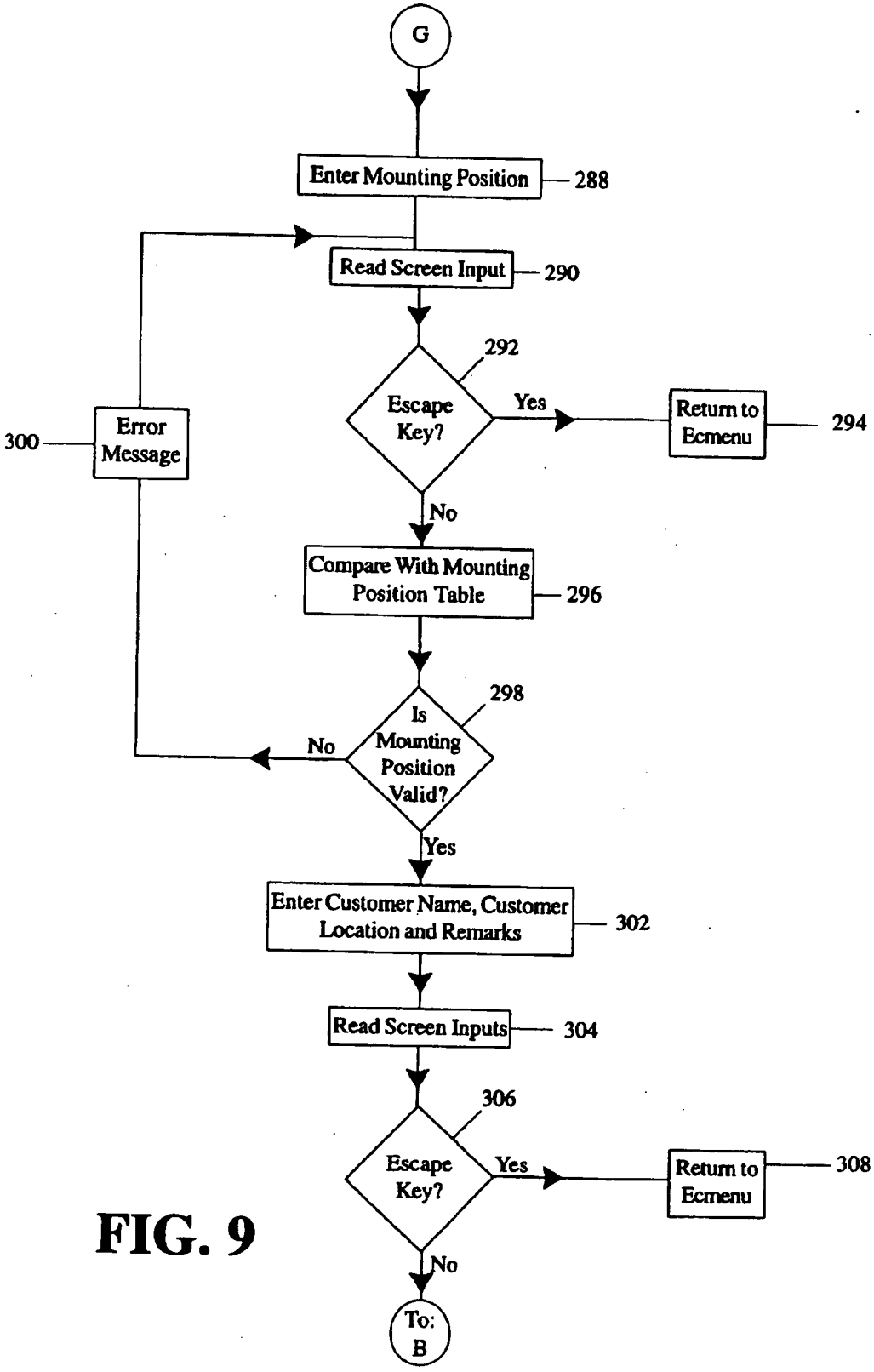

G
Enter Mounting Position
288
Read Screen Input
290
292
Escape Key?
Yes
Return to Ecmenu
294
300
Error Message
No
Compare With Mounting Position Table
296
298
Is Mounting Position Valid?
No
Yes
Enter Customer Name, Customer Location and Remarks
302
Read Screen Inputs
304
306
Escape Key?
Yes
Return to Ecmenu
308
No
To: B

FIG. 9

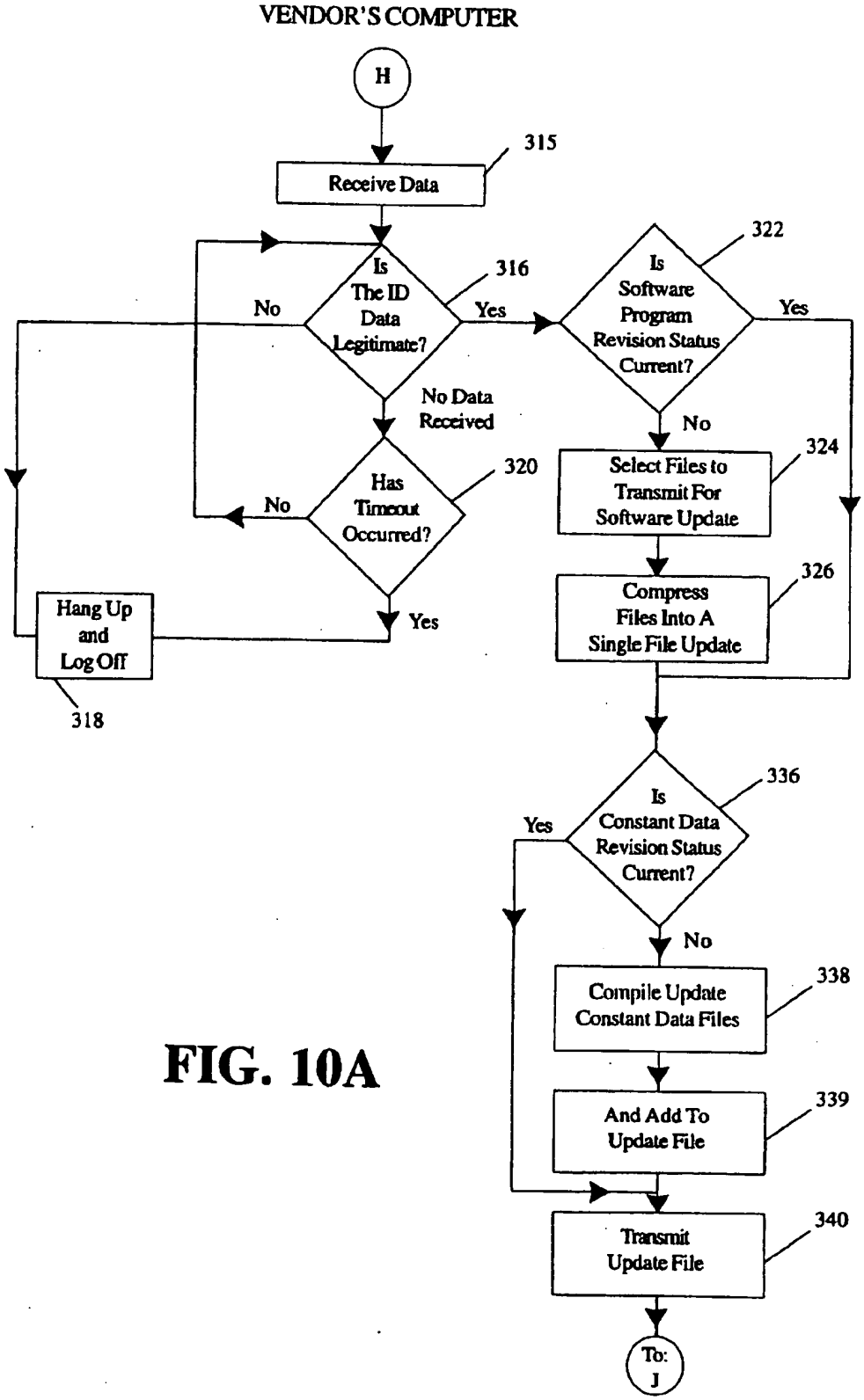

VENDOR'S COMPUTER
H
315
Receive Data
316
Is The ID Data Legitimate?
No
Yes
No Data Received
320
Has Timeout Occurred?
No
Yes
Hang Up and Log Off
318
322
Is Software Program Revision Status Current?
Yes
No
324
Select Files to Transmit For Software Update
326
Compress Files Into A Single File Update
336
Is Constant Data Revision Status Current?
Yes
No
338
Compile Update Constant Data Files
339
And Add To Update File
340
Transmit Update File
To: J

FIG. 10A

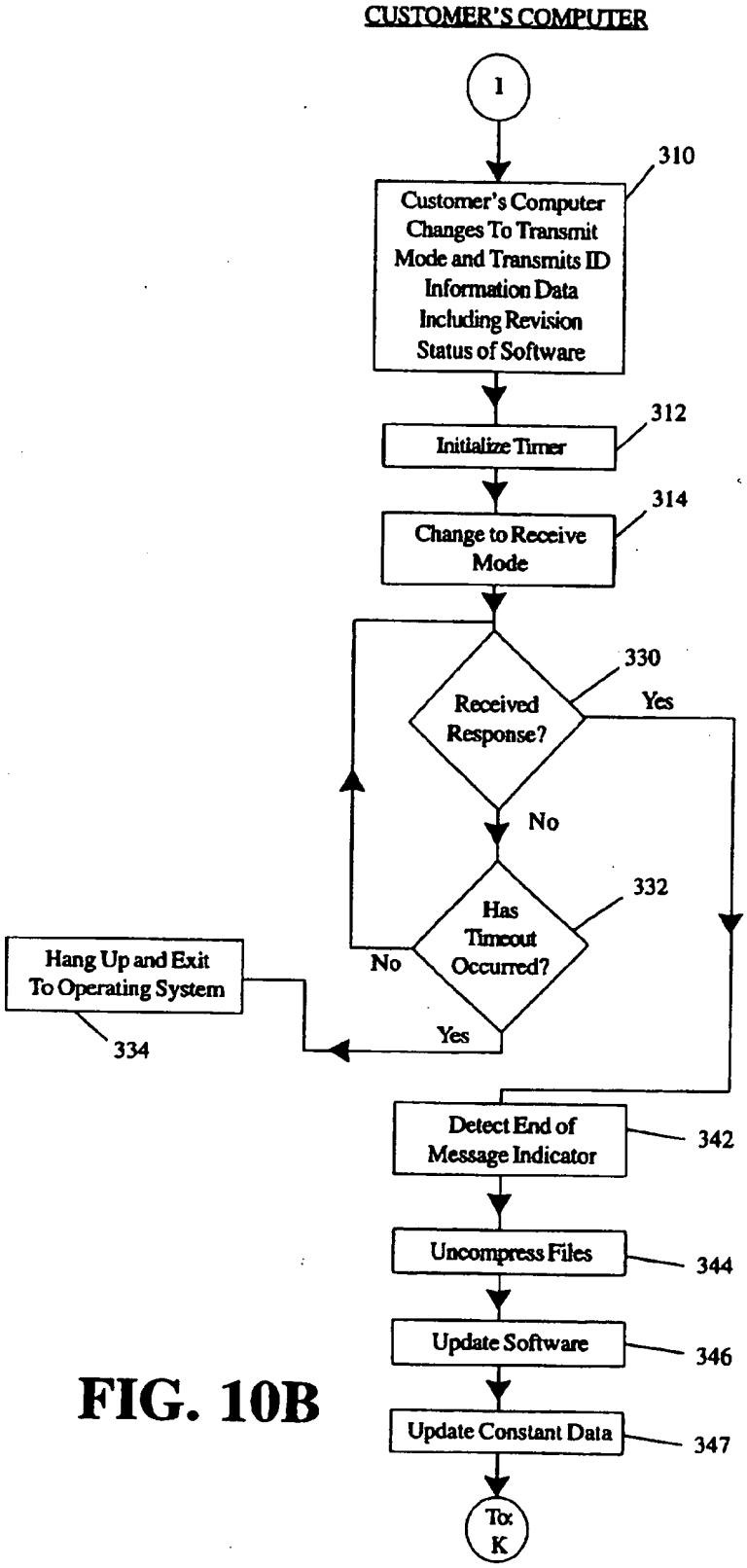

CUSTOMER'S COMPUTER
1
310
Customer's Computer Changes To Transmit Mode and Transmits ID Information Data Including Revision Status of Software
312
Initialize Timer
314
Change to Receive Mode
330
Received Response?
Yes
No
332
Has Timeout Occurred?
No
Yes
Hang Up and Exit To Operating System
334
342
Detect End of Message Indicator
344
Uncompress Files
346
Update Software
347
Update Constant Data
To K

FIG. 10B

VENDOR'S COMPUTER

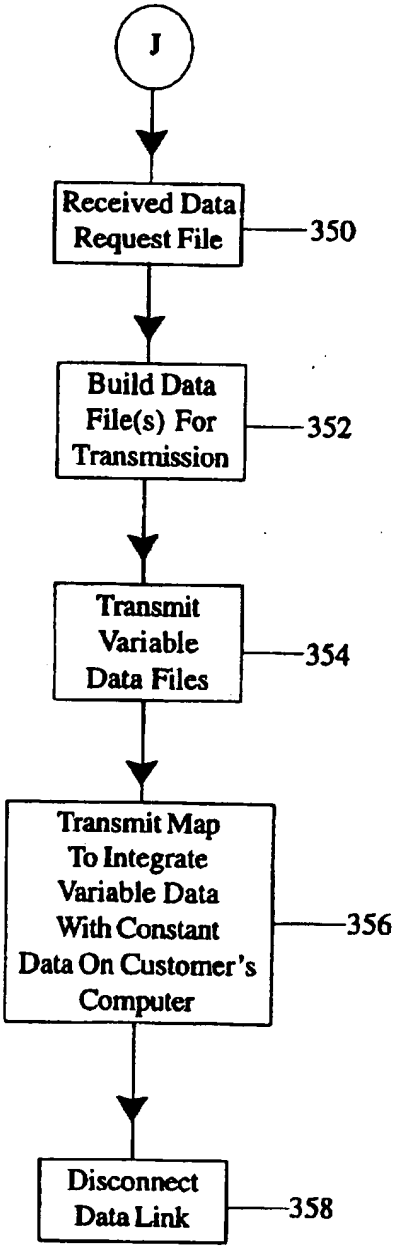


FIG. 11A

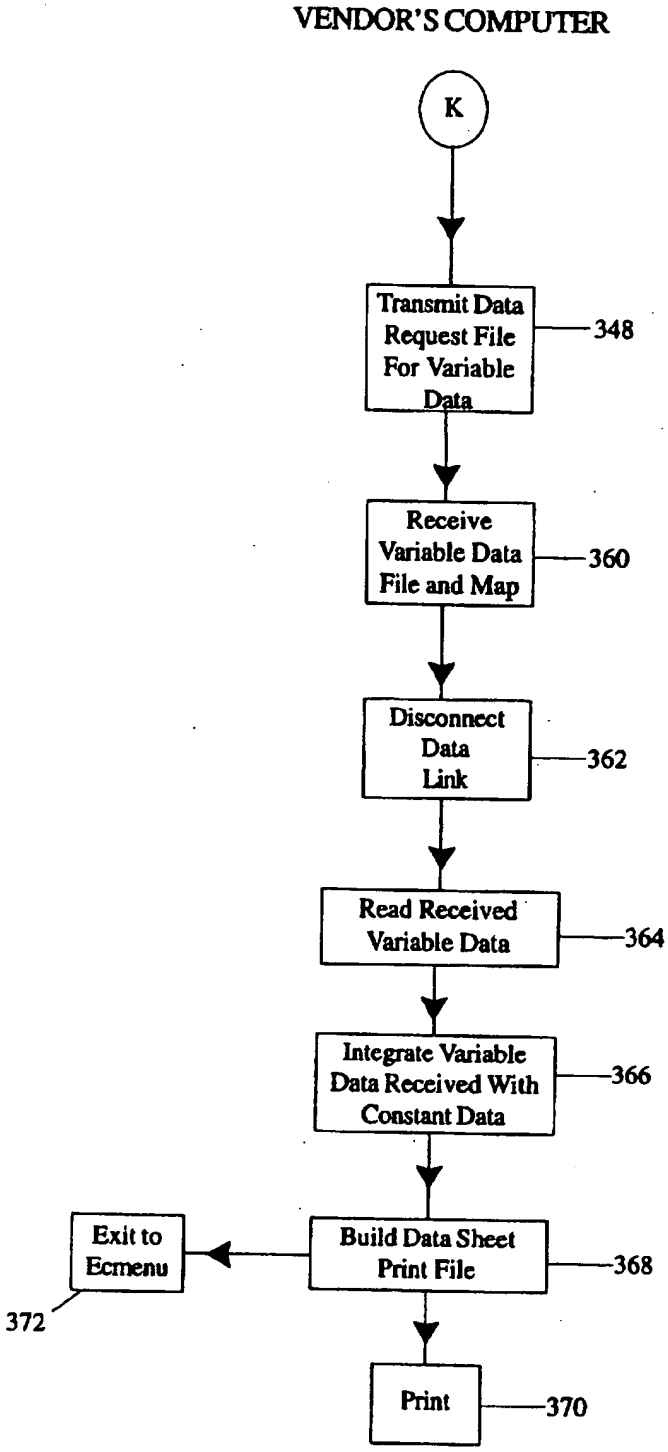

VENDOR'S COMPUTER
K
Transmit Data Request File For Variable Data
348
Receive Variable Data File and Map
360
Disconnect Data Link
362
Read Received Variable Data
364
Integrate Variable Data Received With Constant Data
366
Exit to Ecmenu
372
Build Data Sheet Print File
368
Print
370

FIG. 11B

METHOD FOR UPDATING A REMOTE COMPUTER

This application is a continuation of application Ser. No. 07/866,867 filed Apr. 10, 1992 now U.S. Pat. No. 5,528,490.

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates to an electronic catalog system. More particularly, the present invention relates to an improved electronic catalog system capable of providing a customer at a remote location with accurate updated product information from a vendor each time the customer uses the electronic catalog system.

There are two common types of system architecture that are commonly used in conventional electronic catalog systems. One common system is a dial-up system. The dial-up system includes a remote computer at a customer location with modem capabilities and a main computer at the vendor's location. The customer uses his computer to log on to the vendor's computer as a user. The customer can then browse through a catalog menu on the vendor's computer. The primary disadvantage of a dial-up system is that graphics data cannot be transmitted from the vendor's computer to the customer's computer in a meaningful time frame. It takes a large amount of time to transmit graphics data over telephone lines via a modem, especially if high resolution is desired. Therefore, the dial-up system is not practical for catalogs which include both graphics data and textual data.

A second common electronic catalog system is a system which is located totally on the customer's computer. The data in the customer's computer is periodically updated by the vendor by sending updated data disks. The primary disadvantage of this catalog system is that the data is rarely totally accurate. The accuracy of the data depends on the vendor sending updated data disks to the customer. In addition, the customer must also take the time to install the latest updated data disk onto his computer.

The electronic catalog system of the present invention is designed to reduce the problems associated with the above-mentioned catalog systems. The electronic catalog system of the present invention includes software on the customer's computer and software on the vendor's computer. Therefore, the present electronic catalog system provides a total system architecture. The software handles all communications between the customer's computer and vendor's computer. The customer's computer cooperates with vendor's computer to provide the customer with accurate updated catalog information each time the catalog system is used.

Catalog data is stored on both the vendor's computer and the customer's computer. The vendor's computer contains variable data related to each of the catalog products. Variable data is data that can change at any time. Changes in the variable data can affect the design integrity of the customer's product in which the data is being used. The customer's computer contains all constant data related to the catalog products. Constant data includes both graphics data and textual data. For instance, the customer's computer may include high resolution graphics data illustrating the various catalog items in detail. The customer's computer also includes constant textual data such as a dimensional data layout. Dimensions of the products and cost information are typically considered variable data stored on vendor's computer. If variable data changes, the vendor corrects the variable data entered into vendor's computer. The present invention automatically provides the customer with updated variable data from the vendor's computer without the need to load new data disks onto the customer's computer.

One object of the present invention is to provide the customer with an instantaneous distribution of the latest catalog data available. In operation, the customer browses through general catalog data residing on the customer's computer and determines the exact catalog data required. For example, the customer can select a specific product from a list of products on the customer's computer. Once the desired catalog data has been selected, the electronic catalog system automatically calls the vendor's computer and logs on. The catalog system first checks to determine whether any of the constant data on the customer's computer requires updating. If a constant data update is required, this update is completed prior to filling the customer's request for information. Once the constant data is updated, if necessary, vendor's computer transmits variable data related to the specific product selected by the customer. In addition, vendor's computer transmits a map to the customer's computer which permits the customer's computer to integrate the variable data received from the vendor's computer with constant data related to the selected product stored in the customer's computer. Therefore, a combination of constant data residing on the customer's computer and variable data downloaded from vendor's computer is integrated or merged to create a completely updated data sheet for the selected product. The variable data downloaded from vendor's computer includes the most recent data entered by the vendor. Therefore, the variable data is accurate, and the electronic catalog system of the present invention generates catalog information based only upon the latest vendor data. Advantageously, customers will have instant access to changes in variable data related to the products in the electronic catalog system.

Another object of the present invention is to minimize computer on-line time. A common disadvantage of conventional dial-up catalog systems is that a customer can log on to a vendor's computer and never log off. In other words, the customer has control over when to log on and when to log off vendor's computer. This can tie up vendor's computer for long periods of time. To overcome this disadvantage, conventional catalog systems often depend on a time out to automatically log the customer off the vendor's computer.

In the electronic catalog system of the present invention, the customer does not have the privilege of determining when to log on or when to log off the vendor's computer. The catalog system of the present invention automatically determines when it is necessary to log on to vendor's computer to retrieve additional data. Because all of the general catalog data is resident on the customer's computer, the normal browsing the user might do is accomplished locally at the customer's computer. The customer's computer automatically connects itself to vendor's computer and automatically requests the needed information only after the desired product has been selected from data on the customer's computer. The customer's computer automatically logs off vendor's computer after the requested data is received. Therefore, the electronic catalog system of the present invention typically reduces the on-line time by about 70–80%.

Yet another object of the present invention is to increase system security. System security is a serious problem that confronts any company that allows others to have access to data residing on its computer system. In conventional catalog systems, a customer can log on to a vendor's computer to access information. It is often possible for a computer hacker to discover a password and gain access to the system. This can cause damage to the system and provide the

computer hacker access to confidential information. In the electronic catalog system of the present invention, the software controls when the customer's computer must log on to vendor's computer. In addition, the customer's computer automatically logs off vendor's computer after the required information is downloaded. Therefore, the present catalog system reduces customer access to vendor's computer system. This increases system security.

According to one aspect of the present invention, a method is provided for producing information related to a selected product on a remote computer. The method includes the steps of storing and maintaining variable data and constant data related to a plurality of products in a memory of a main computer and storing constant data related to a plurality of products in a memory of a remote computer. The method also includes the steps of selecting a product from the remote computer memory for which product information is desired, comparing constant data revision status in the memory of the main computer with constant data revision status in the memory of the remote computer, and updating constant data in the memory of the remote computer with constant data stored in the memory of the main computer that is different from the constant data stored in the memory of the remote computer. The method further includes the step of transmitting variable data related to the selected product from the main computer to the remote computer, and integrating constant data stored in the memory of the remote computer associated with the selected product with the variable data received from the main computer to provide product information related to the selected product including both constant and variable data.

The method for producing information related to a selected product on a remote computer still further includes the steps of automatically connecting the remote computer to the main computer after the selecting step, and automatically disconnecting the remote computer from the main computer after the variable data related to the selected product is transmitted from the main computer to the remote computer. In addition, the method includes the step of transmitting a map from the main computer to the remote computer along with the variable data to permit the remote computer to perform the integrating step. The method may also include the step of displaying or printing the information related to the product generated by the remote computer during the integrating step. In a preferred embodiment of the present invention, the constant data stored in the memory of the main computer and the constant data stored in the memory of the remote computer includes both graphics data and textual data.

According to another aspect of the present invention, the method for producing information related to a selected product on a remote computer includes the steps of storing and maintaining a main revision status in the memory of the main computer and storing a remote revision status in the memory of the remote computer. The main revision status indicates the revision level of the constant data stored in the main computer, and the remote revision status indicates the revision level and the constant data stored in the remote computer. The step of comparing constant data in the memory of the remote computer with constant data in the memory of the main computer includes the step of comparing the remote revision status with the main revision status maintained in the main computer.

The constant data updating step illustratively includes the steps of determining updated portions of the constant data stored in the main computer that are different than the constant data stored in the remote computer, transmitting the updated portions of the constant data stored in the main computer from the main computer to the remote computer, and replacing portions of the constant data stored on the remote computer with the updated portions of constant data received from the main computer. The constant data updating step also illustratively includes the step of transmitting a new remote revision status identical to the main revision status from the main computer to the remote computer.

According to yet another aspect of the present invention, a method is provided for installing a computer program on a remote computer. The method includes the steps of storing and maintaining a computer program on a main computer, generating registration data at the remote computer, and transmitting the registration data generated at the remote computer to the main computer. The method also includes the steps of creating an identification number at the main computer based on the registration data transmitted from the remote computer, transmitting the program from the main computer to the remote computer including the identification number, and storing the program and the identification number in the remote computer.

According to still another aspect of the present invention, a method is provided for automatically updating a program on a remote computer. The method includes the steps of storing a program and a remote program revision status in a memory of a remote computer, and maintaining the latest revisions of the program and a main program revision status in a memory of a main computer. The remote program revision status indicates the revision level of the program stored in the memory of the remote computer, and the main program revision status indicates the revision level of the program stored in the memory of the main computer. The method also includes the steps of transmitting the remote program revision status from the remote computer to the main computer, and comparing the remote program revision status to the main program revision status. The method further includes the step of updating portions of the program stored in the memory of the remote computer that are different from the program stored and maintained in the memory of the main computer.

The program updating step illustratively includes the steps of determining updated portions of the program stored in the main computer that are different from the program stored in the remote computer, transmitting the updated portions from the main computer to the remote computer, and replacing portions of the program stored on the remote computer with the updated portions received from the main computer. The remote revision status is transmitted to the main computer each time a communication session is initiated between the remote computer and the main computer. The program updating step also illustratively includes the step of transmitting a new remote program revision status identical to the main program revision status from the main computer to the remote computer.

According to still another aspect of the present invention, a method is provided for automatically detecting pirated copies of the software. The method includes the steps of storing and maintaining a computer program on a main computer, generating a unique serialization number, and transmitting the unique serial number generated by the main computer to the remote computer. The method also includes the step of maintaining serial number, serial number validation, registration data, and program revision status data by the main computer. The method also includes the transmitting of the program serial number and program revision status from the remote computer to the main computer, and the comparison of the serial number and

program revision status transmitted from the remote computer to the serial number and program revision status maintained by the main computer.

According to a further aspect of the present invention, an electronic catalog system includes a main computer having a main memory for storing variable data and constant data related a plurality of products. The electronic catalog system also includes a remote computer having a remote memory for storing constant data related to a plurality of products. The electronic catalog system further includes means for transmitting a request for variable data related to a selected product from the remote computer to the main computer, means for comparing constant data in the remote memory with constant data in the main memory, means for determining which portions of the constant data stored in the main memory are different from the constant data stored in the remote memory, means for transmitting updated portions of the constant data stored in the main memory from the main computer to the remote computer, and means for replacing portions of the constant data stored in the remote memory with the updated portions of constant data received from the main computer. In addition, the electronic catalog system includes means for transmitting variable data related to the selected product stored in the main memory from the main computer to the remote computer, and means for integrating constant data related to the selected product stored in the remote memory with the variable data related to the selected product received from the main computer to generate information related to the selected product including both constant data and variable data. The electronic catalog system further includes means for automatically connecting the remote computer to the main computer, and means for automatically disconnecting the remote computer from the main computer after the variable data related to the selected product is transmitted from the main computer to the remote computer.

According to a further aspect of the present invention, the electronic catalog system includes means for storing and maintaining a main revision status in the memory of the main computer, and means for storing a remote revision status in the memory of the remote computer. The main revision status indicates the revision level of the constant data stored in the main computer. The remote revision status indicates the revision level of the constant data stored in the remote computer. The means for comparing constant data in the remote memory with constant data in the main memory compares the remote revision status with the main revision status maintained in the main computer. This revision level indicates which portions of the constant data have been updated.

According to another aspect of the present invention, a system for automatically updating a program stored in a remote computer includes a remote computer having a remote memory for storing a program and a remote program revision status. The remote program revision status indicates the revision level of the program stored in the remote memory. The system also includes a main computer having a main memory for storing the latest revisions of the program and a main program revision status. The main program revision status indicates the revision level of the program stored in the main memory. The system further includes means for transmitting the remote program revision status from the remote computer to the main computer, means for comparing the remote program revision status to the main program revision status, and means for determining which portions of the program stored in the main memory are different from the program stored in the remote memory. The system also includes means for transmitting updated portions of the program stored in the main memory from the main computer to the remote computer, means for replacing portions of the program stored in the remote memory with the updated portions of the program received from the main computer, and means for transmitting the new program revision status from the main computer to the remote computer.

According to a further aspect of the present invention, a system for installing a program on a remote computer includes a main computer including a main memory for storing a program. The system also includes means for generating registration data on a remote computer and means for transmitting the registration data generated at the remote computer from the remote computer to the main computer. The system further includes means for generating an identification number at the main computer based on the registration data transmitted from the remote computer, means for transmitting the program and the identification number from the main computer to the remote computer, and means for storing the program in the remote computer.

According to an additional aspect of the present invention, a system for detecting pirated copies of a serialized software program includes a remote computer including a remote memory for storing a program, a remote revision level, and a program serial number. The system also includes a main computer including a main memory for storing the program serial number, the remote revision level corresponding to the program serial number, and a validation code for a remote program corresponding to the serial number. The validation code indicates whether the program stored in the remote memory is valid or invalid. The system further includes means for transmitting the remote revision level and the program serial number stored in the remote memory from the remote computer to the main computer, and means for comparing the remote program revision level received from the remote computer to the remote program revision level stored in the main memory corresponding to the program serial number received from the remote computer. The system still further includes means for changing the validation code to indicate the serial number is invalid upon detection by the comparing means of a difference between the remote program revision level received from the remote computer and the remote program revision level stored in the memory of the main computer corresponding to the program serial number received from the remote computer. The system still further includes means for detecting whether the program stored in the remote memory is valid or invalid based upon the validation code corresponding to the program serial number received from the remote computer, and means for denying access to data stored in the memory of the main computer when the program corresponding to the serial number stored in the remote memory is invalid.

Additional objects, features, and advantages of the invention will become apparent to those skilled in the art upon consideration of the following detailed description of a preferred embodiment exemplifying the best mode of carrying out the invention as presently perceived.

BRIEF DESCRIPTION OF THE DRAWINGS

The detailed description particularly refers to the accompanying figures in which:

FIG. 1A is a diagrammatical view of the electronic catalog system of the present invention;

FIG. 1B is a block diagram illustrating the software and data stored in the memory of the vendor's computer;

FIG. 1C is a block diagram illustrating the software and data stored in the memory of the customer's computer;

FIGS. 2A and 2B are flow charts 2 is a flow chart illustrating the steps performed by the electronic catalog system of the present invention during a first portion of the procedure for installation and serialization of software onto the customer's computer;

FIG. 3 is a flow chart illustrating the steps performed by the electronic catalog system during registration of the software on the customer's computer;

FIG. 4 is a flow chart illustrating the steps performed by the electronic catalog system when the customer's computer dials up the vendor's computer to establish a communication link;

FIG. 5 is a flow chart illustrating further steps performed by the electronic catalog system during initial communications between the customer's computer and vendor's computer;

FIGS. 6A and 6B are charts illustrating steps performed by vendor's computer and steps performed by the customer's computer during an initial identification period;

FIGS. 7A, 7B, and 7C are flow charts illustrating the steps performed by the electronic catalog system to serialize the software according to registration data and to install the software onto the customer's computer automatically;

FIG. 8 is a flow chart illustrating the steps performed by the electronic catalog system as the customer browses through the electronic catalog menu resident on the customer's computer to request catalog information;

FIG. 9 is a flow chart illustrating further steps performed by the electronic catalog system to prompt additional data from the customer related to the desired products;

FIGS. 10A and 10B are flow charts illustrating the steps conducted by the electronic catalog system to check and update software on the customer's computer and to check and update constant data located on the customer's computer; and

FIGS. 11A and 11B are flow charts illustrating the steps performed by the electronic catalog system during transmission of variable data from the vendor's computer to the customer's computer and during integration of the variable data requested with the constant data resident on the customer's computer.

DETAILED DESCRIPTION OF THE DRAWINGS

Before discussing the preferred embodiment of the present invention which is described and illustrated in detail with reference to FIGS. 1A–11, it should be noted that, although the invention will be discussed in terms of its applicability to an electronic catalog system for generating information including variable data and constant data related to a plurality of products, the broader aspects of the invention are not necessarily limited to this particular application. Although the preferred embodiment of the invention described below does offer particular advantages in the field of electronic catalog systems, it is felt that the adaptation and application of the invention to other fields will also be advantageous. Accordingly, the scope of the invention is not intended to be limited by the details of the preferred embodiment discussed below, but rather by the terms of the claims following this detailed description.

Referring now to the drawings, FIG. 1A illustrates a block diagram of the electronic catalog system **10** of the present invention. The electronic catalog system **10** is designed to provide a customer with catalog data which is current and updated with the most recent updates in vendor's catalog. The catalog system **10** includes a vendor's computer **12** located at the vendor's place of business. Illustratively, vendor's computer **12** is a COMPAQ SYSTEMPRO® available from the Compaq Computer Corporation.

Vendor's computer **12** is coupled to a multi-port intelligent communications array **14**. Illustratively, communications array **14** is an Ultra INUX 1610A 16 port model available from Comtrol. Multi-port communications array **14** is coupled to a modem **16**. Modem **16** is illustratively a model 2400SA available from Practical Peripherals. SCO UNIX V1386 release 3.2.2 operating system and Oracle Release 5.1.22.1 database system are used.

Catalog system **10** also includes a computer **18** located at a remote customer's location. Customer's computer **18** is illustratively a COMPAQ DESKPRO® available from Compaq Computer Corporation. A Microsoft DOS 5.0 operating system is used. Customer's computer **18** is coupled to a modem **20**. Modem **20** is either 2400 baud or 1200 baud modem which is Hayes compatible. Modem **20** is illustratively a model 2400SA modem available from Practical Peripherals. Modem **16** at vendor's location communicates with modem **20** at customer's location via a telephone communications lines **22**. Customer's computer **18** is also coupled to a printer **24** which prints data sheets compiled by the electronic catalog system **10**. Illustratively, printer **24** is an HP Laser Jet printer available from Hewlett Packard. A dot matrix printer may also be used.

Vendor's computer **12** includes a 32-bit, 33-MHZ microprocessor **26**. Illustratively, microprocessor **26** is an Intel 386 or an Intel 486 model microprocessor available from Intel Corporation. Vendor's computer **12** also includes a 12 megabyte internal RAM. Illustratively, a 420 megabyte hard disk drive **30** is also included. Vendor's computer **12** further includes a VGA graphics monitor **31**.

As illustrated in FIG. 1B, application software is stored on hard disk drive **30** of vendor's computer **12**. The application software on vendor's computer **12** includes communications software, map generation software, interpretation of data request software, variable data generation software, installation and registration software, identification and piracy detection software, and revision status and update software. In addition, hard disk drive **30** of vendor's computer **12** is used to store variable data, constant data, a map data base, a registration data base, a validation data base, a revision data base, and application software for the customer's computer **18**.

Customer's computer **18** includes a 16-MHZ 386 SX microprocessor **32** available from Intel Corporation. The computer **18** also includes a one megabyte internal RAM **34** and a fixed 60 megabyte hard disk drive **36**. Customer's computer **18** further includes an EGA or VGA graphics monitor **38**, a floppy disk drive **40**, and a serial communications port **42**. As illustrated in FIG. 1C, application software is stored on hard disk drive **36** of customer's computer **18**. Application software on customer's computer **18** includes communications software, installation and registration software, data request software, map interpretation software, data integration software, and identification and revision software. In addition, constant data and identification and revision data are stored on hard disk drive **36** of customer's computer **18**.

The communication software stored on vendor's computer **12** and customer's computer **18** is a copyrighted communications software module available from CADDCENTERS in Indianapolis, Ind. The variable data genera-

tion software stored on vendor's computer 12 works as follows. Customer's computer 18 generates a SQL statement that is sent to vendor's computer 12. Vendor's computer 12 interprets and uses the SQL statement in a conventional manner to access specified data within the variable data base stored in the memory of vendor's computer 12. SQL is an ANSI standard computer language.

It is understood that any computer with 512 K of RAM, a hard disk with at least two megabytes of free space, either a 5¼" or a 3½" floppy disk drive, a serial port, and a graphics monitor may be used with the present invention as customer's computer 18. If the customer desires to print out catalog data sheets, a printer 24 must be provided.

The distribution of graphics data by phone lines 22 is very slow, especially if high resolution is desired. As a result, it is common practice to provide high quality technical specification sheets by mail or courier. The electronic catalog system 10 of the present invention overcomes the speed disadvantage by creating a graphics catalog data base using both parametric design techniques and distributed data design techniques. When the customer requests information from the vendor that includes graphics data, the variable data is obtained by dialing vendor's computer 12 and downloading the required data. This data is then merged with locally resident graphics data previously stored on customer's computer 18 to generate a complete data sheet which includes both graphics and textual data. Therefore, the present system 10 combines the techniques of a distributed data base system with a parametric design system to minimize thetime required for a customer to access vendor's computer 12 on a real time basis. Therefore, the present invention makes it practical for a vendor to offer technical data sheets with high resolution graphics to its customer on a real time basis.

Examples of variable data used for generation of product data sheets include product titles, numbers, dimensional data, specifications. Variable data is stored in Vendor's computer 12. Examples of constant data used for generation of data sheets include logos, graphics data for outlines and boxes, format data which labels the units of the product specifications (i.e. Hertz, Volts, RPM, etc), and graphics data illustrating the configuration of various products. Constant data is stored in customer's computer 18.

The electronic catalog software installation and support files are provided to a customer on 3½", 1.44 megabyte diskettes. The electronic catalog system 10 of the present invention provides automatic serialization and software registration during installation of the software. Vendor's computer 12 controls the automatic serialization and registration of the software located on customer's computer 18. In addition, vendor's computer 12 automatically checks for necessary updates in customer's software and then automatically updates the software in customer's computer 18 if such changes are required.

The purpose of this serialization and registration function is to provide a method of insuring registration of the software and to provide a dynamic means of serializing each installed software package. To accomplish this, special purpose software is provided on a floppy disk to the customer at customer's remote computer 18. This installation software controls the hardware to download a serialized copy of software from vendor's computer 12 to customer's computer 18. In addition, the installation software prepares customer's computer 18 for its intended use of the software.

The installation software included on a floppy disk is placed in an appropriate drive 40 of customer's computer 18 which is illustratively drive A for demonstration purposes. Drive A is selected as the current working drive by typing "a:" and "enter" on customer's computer 18.

FIGS. 2A and 2B illustrates a flow chart of the steps performed by the electronic catalog system 10 during installation of the software onto customer's computer 18. The diskette is installed as illustrated by block 50. To start the program, the customer types "install" and "enter". Customer's computer 18 generates a screen with multiple questions to install the software and to provide software registration information. A file labelled "autoexec.bat" on customer's computer 18 will be modified by the installation software. Therefore, the user is queried at block 56 for the drive on which the autoexec.bat file can be found. Customer's computer 18 reads the drive response at block 58. Customer's computer 18 confirms that the file is on the drive entered at block 60. If the file is not found, a message is printed at block 62 and the user is prompted to reenter the drive. Customer's computer 18 continues to loop until the correct drive is input.

Once the autoexec.bat file is verified, the user is queried for the hard drive on which he wishes to install the electronic catalog program (ECAT) as illustrated at block 64. Customer's computer 18 reads the entered drive at block 66. The drive given must be a legitimate drive on customer's computer 18. This is checked at block 68. If the drive is not legitimate, customer's computer 18 generates an error message and loops back at block 70 until a legitimate drive is input.

The customer is then queried for the baud rate of his modem at block 72. Customer's computer 18 reads the entered baud rate at block 74. Customer's computer 18 determines whether the entered modem baud rate is supported by the system at block 76. If the baud rate is not supported, an error message is printed at block 78 and the customer is again queried for the baud rate at block 72. There will always be a finite number of baud rates. Currently, the available modem baud rates are either 1200 baud and 2400 baud. The software will continue to loop until one of these two baud rates is entered.

Once a proper baud rate for modem 20 is entered, the customer is queried for his phone type, either tone or pulse, at block 80. These are the standard phone types today. Other types may be added in the future. Again, the user must respond with a currently acceptable phone type. Customer's computer 18 reads the response at block 82 and verifies that either a "T" or a "P" was entered at block 84. If a "T" or "P" was not entered, customer's computer 18 prints an error message at block 86 and the customer is again queried for the phone type at block 80.

The customer is then queried for the telephone number of his vendor's computer 12 at block 88. Customer's computer 18 reads the response at block 90, and the answer is checked against known acceptable telephone number formats. If the format is not correct, customer's computer 18 prints an error message at block 94 and the customer is again queried for telephone number at block 88.

The customer is next queried at block 96 in FIG. 3 for a list of registration data that is required for registration of the software that is to be downloaded from vendor's computer 12. This registration data includes the customer's name, the customer's company name, Division, Company Address, Company City, Company State, Province, Country, Zip/Postal Code, and Company Voice Telephone Number. Additional registration data may also be included, if desired. Customer's computer 18 reads the registration data input at block 98. The registration data is then verified at block 100.

Specifically, customer's computer **18** verifies that at least two characters have been entered and that only numbers are entered for the telephone number. If the registration data is not verified, customer's computer **18** prints a message for the customer to reenter the registration data at block **102**. and the customer is again queried for registration data at block **96**.

If the registration data is verified, customer's computer **18** has sufficient information to permit the modification of customer's computer **18** configuration and to request a serialized copy of the electronic catalog software from vendor's computer **12**. Before proceeding, the customer is prompted at block **104** to determine whether the customer wishes to continue or abort the installation. Customer's computer **18** reads the response at block **106**. Customer's computer **18** determines whether the continue or the abort selection was made block **108**. If the customer selected to abort the installation, customer's computer **18** exits to the operating system at block **110**. If the customer selected to continue the installation, customer's computer **18** writes the registration and identification data to a file at block **111**. The autoexec.bat file is modified at block **112**, and a subdirectory for the ECAT program is created at block **114** pursuant to a previous user response.

As illustrated in FIG. **4**, the communications and data handling software functions are then loaded onto customer's computer **18** at block **116**. Customer's computer **18** then automatically dials the telephone number of vendor's computer **12** as illustrated at block **118**. The telephone number of vendor's computer **12** is found in the registration and identification data file previously stored on customer's computer **18** at block **111** in FIG. **3**. It is understood that communications between vendor's computer **12** and customer's computer **18** could also be implemented on a wide area network (WAN) in which several different communication tools could be used. These communication tools include, for example, multiple local area networks, satellite communications, land lines, and optic lines.

The customer is advised that customer's computer **18** is dialing vendor's computer **12** at block **120** Customer's computer **18** sets an answer timer at block **122**. Customer's computer **18** determines whether vendor's computer **12** has answered the telephone call at block **124**. If vendor's computer **12** has not answered, customer's computer **18** determines whether the answer time limit has been exceeded at block **126**. If the answer time limit has been exceeded, customer's computer **18** prints a message indicating that the time has been exceeded and advising the customer to check the dial up number at block **128**. The system then exits back to block **56** in FIG. **2A** (registration screen) at block **130**.

If the answer timer has not been exceeded, customer's computer **18** determines whether the vendor's telephone line is busy at block **132**. If vendor's telephone line is not busy, customer's computer **18** continues to wait until vendor's computer **12** answers or until the answer timer limit has been exceeded. If vendor's telephone line is busy, customer's computer **18** queries the customer whether to redial the number at block **134**. If the customer does not wish to redial the number, customer's computer **18** exits to the operating system at block **136**. If the customer wishes to redial the number, customer's computer **18** disables the dial-up answer timer at block **138** and enables the redial timer at block **140**. The redial timer sets a predetermined delay period for redialing vendor's computer number. After the redial timer has exceeded a preset limit at block **142**, customer's computer **18** dials vendor's computer number again at block **118**.

If vendor's computer **12** answers the call from customer's computer **18**, customer's computer **18** detects the link with vendor's computer **12** at block **144** in FIG. **5**. A timer is set at block **146**. Customer's computer **18** then waits for an acknowledgement from vendor's computer **12** that vendor's computer **12** has recognized the computer link at block **148**. If vendor's computer **12** has not recognized the link, customer's computer **18** determines whether the time limit set by the timer **146** has been exceeded at block **150**. If the time limit has not been exceeded, customer's computer **18** waits for the indication that vendor's computer **12** has recognized the computer link by returning to block **148**. If the time limit set by timer **146** has been exceeded, customer's computer **18** prints a message that there was no response from vendor's computer **12** at block **152**. Customer's computer **18** then hangs up and exits back to block **56** in FIG. **2A** (registration screen) at block **154**.

If vendor's computer **12** sends an acknowledgment that vendor's computer **12** has recognized the computer link, customer's computer **18** reads the message at block **156**. Customer's computer **18** then determines whether the message at **156** was a log on at decision block **158**. If the message at block **156** was not a log on, customer's computer **18** prints a message that an incorrect response has been received from vendor's computer **12** at block **160**. Customer's computer **18** then hangs up and exits back to block **56** in FIG. **2A** (registration screen) at block **162**.

If the acknowledgment message from vendor's computer **12** is a log on, customer's computer **18** automatically transmits the customer name to vendor's computer **12** at block **164**. A timer is set at block **166**. Customer's computer **18** waits for vendor's computer **12** to accept customer's name at block **168**.

In FIGS. **6** and **7**, the steps performed by vendor's computer **12** are illustrated in FIGS. **6A** and **7A** and the steps performed by customer's computer **18** are illustrated in FIGS. **6B**, **7B**, and **7C**. Vendor's computer **12** transmits a log on prompt at block **170** in FIG. **6A**. After transmitting customer's log on at block **164**, customer's computer **18** changes to a receive mode at block **172**. Vendor's computer **12** determines whether the log on is legitimate at block **174**. If the log on is not legitimate, vendor's computer **12** will automatically hang up at block **176**. If no log on has been received, vendor's computer **12** determines whether a time-out has occurred at block **178**. If a time-out has not occurred, vendor's computer **12** waits to receive the log on information by returning to block **174**. If the time-out has occurred, vendor's computer **12** hangs up at block **176**.

If the log on received from customer's computer **18** is legitimate, vendor's computer **12** changes to the transmit mode and transmits a password prompt to customer's computer **18**. Vendor's computer **12** then changes to the receive mode and initializes a password timer at block **182**. Customer's computer **18** monitors whether the password prompt has been received at block **184**. If the password prompt has not been received customer's computer **18** determines whether a time-out has occurred at block **186**. If the time-out has not occurred, customer's computer **18** continues to wait for the password prompt by returning to block **184**. If a time-out has occurred, customer's computer **18** will hang up and display an error message and returns to block **56** in FIG. **2A** (registration screen) at block **188**.

Once the password prompt has been received, customer's computer **18** changes to transmit mode and transmits the password to vendor's computer **12** at block **190**. Customer's computer **18** then initializes a timer at block **191** and changes to a receive mode at block **194** to wait for further input from vendor's computer **12**. Vendor's computer **12**

receives the password from customer's computer **18** at block **195** and determines whether the password is legitimate at block **196**. If the password is not legitimate, vendor's computer **12** hangs up at block **198**. If no password has been received, vendor's computer **12** determines whether a time-out has occurred at block **200**. If a time-out has not occurred, vendor's computer **12** waits an additional time period to receive the password from customer's computer **18** by returning to block **196**. If a time-out has occurred, vendor's computer hangs up at block **198**.

If the password received from customer's computer **18** is legitimate, vendor's computer **12** changes to the transmit mode and transmits a prompt to customer's computer **18** as illustrated at block **202**. Vendor's computer **12** then changes to a receive mode and initiates a timer at block **204**. Customer's computer **18** detects whether a prompt has been received at block **206**. If no prompt has been received, customer's computer **18** determines whether or not a time-out has occurred at block **208**. If a time-out has not occurred, customer's computer **18** continues to wait for a prompt to be received by returning to block **206**. If a time-out has occurred, customer's computer **18** hangs up, generates an error message, and returns to block **56** in FIG. **2A** (registration screen) at block **210**.

If a prompt has been received, customer's computer **18** changes to transmit mode and transmits coded identification and a request for installation or support as illustrated at block **212** in FIG. **7B**. Customer's computer **18** initializes a timer at block **214** and changes to a receive mode at block **216**. Vendor's computer **12** checks the identification file received from customer's computer **18** to determine whether the identification file is valid as illustrated at block **218**. Vendor's computer **12** compares the identification file received from customer's computer **18** with a validation data file stored on hard drive **30** of vendor's computer **12**. The validation data file includes each serial number generated by vendor's computer **12** for each customer of the vendor. In other words, each customer that downloads software from vendor's computer **12** has an individual serial number which identifies that particular customer. Therefore, vendor's computer **12** can track the software of each customer separately to determine if the software has been pirated as discussed below. The validation data file also stores the revision level of the software and constant data corresponding to each serial number and an indication of the validation status of each particular serial number. The validation status indicates whether the software stored in the customer's computer **18** is valid or invalid. A "YES" validation status indicates that the software is valid. A "NO" validation status indicates that the software has been pirated. An example of the validation data file and the step of validating the software on customer's computer **18** is illustrated below.

In the validation process, the identification data sent by customer's computer **18** must contain both a serial number and a revision level that matches the validation data file stored in the validation data file on vendor's computer **12**.

As an example, if the complete program for serial number 0001 0101 0001 with a revision level of **2** had been pirated, the first copy of the software to access vendor's computer for data would be automatically updated to revision level **3**, assuming that the main program revision status was at revision level **3**. The validation data file would then read as follows:

VALIDATION DATA FILE

Serial Number	Revision Level	Validation
0001 0101 0001	3	Y
0001 0101 0002	2	Y

The next copy of the software to access vendor's computer **12** (a different copy than the first copy), whether it is the original installed copy or the pirated copy, would submit identification data to vendor's computer with the correct serial number, i.e. 0001 0101 0001, but the incorrect revision level 2. Vendor's computer **12** detects the different revision level and sends a message "Invalid Registration. Please Re-install Your Software" to customer's computer **18**. Vendor's computer **12** then revises the validation data file to place a "NO" in the validation status column of the validation data file. All future attempts to access data by the serial number 0001 0101 0001 will be refused. The revised validation data file would read as follows:

REVISED VALIDATION FILE

Serial Number	Revision Level	Validation
0001 0101 0001	3	N
0001 0101 0002	2	Y

If the identification data file is not valid, vendor's computer **12** hangs up and logs off at block **220**. If no identification and registration data file has been received, vendor's computer **12** determines whether a time-out has occurred at block **222**. If a time-out has not occurred, vendor's computer **12** waits an additional period of time to receive the identification and registration data from customer's computer **18** by returning to block **218**. If a time-out has occurred, vendor's computer **12** hangs up and logs off at block **220**.

If the identification data received from customer's computer **18** is valid, vendor's computer **12** determines at block **223** whether the request sent from customer's computer **18** at block **212** was to install files or for support files. If the request was to install files, an identification serial number based on the registration data is automatically generated at block **224** and the necessary software is transmitted to customer's computer **18** at block **226**. If the request was for support files, support files are transmitted to customer's computer **18** at block **226**. The registration data and serial number is appended to the registration file at vendor's computer **12**. The serial number, program revision level, and validation code is appended to the validation file at Vendor's computer **12**. Vendor's computer **12** also sends a log on name and password for later use by customer's computer **18** to access product data. Vendor's computer **12** then hangs up and logs off at block **228**.

Customer's computer **18** waits to receive a response from vendor's computer **12** at location **230**. If a response has not been received, customer's computer **18** determines whether a time-out has occurred at block **232**. If a time-out has occurred, customer's computer **18** hangs up and exits to the operating system at block **234**. If a time-out has not occurred, customer's computer **18** waits for an additional period of time to receive the information from vendor's computer **12** by returning to block **230**. Customer's computer **18** detects whether transmitted data is being received at block **236**. If data is being received, customer's computer

18 initializes a timer at block 238. If transmitted data is not being received, customer's computer 18 determines whether an end of message indicator has been received at block 240. If the end of the message has not been received, customer's computer 18 determines whether a time-out has occurred at block 242. If a time-out has occurred, customer's computer 18 displays an error message and exits to the operating system at block 244. If a time-out has not occurred, customer's computer 18 waits an additional period of time for the end of message indicator by returning to block 236.

After an end of message indicator has been received at block 240, customer's computer 18 uncompresses all the files. A message is displayed on customer's computer 18 reading, "Copying DOS Program Files—x file(s) copied". Files received from vendor's computer 12 is distributed to hard disk 36 of customer's computer 12 at block 245.

Customer's computer 18 prompts the customer to type "c" to Continue or "ESC" if the support disk is not available at block 246. Customer's computer 18 determines whether "c" or "ESC" was selected at block 247. If "ESC" was selected, customer's computer 18 returns to location B in FIG. 4 and will redial the vendor's computer 12 and the necessary support files will be downloaded as illustrated at block 248. The support file download is the same as the install download except for the actual files being downloaded.

If "c" was selected, a message "Insert Support Disk #1, Type Any Key to Continue" will be displayed at customer's computer 18 as illustrated at block 249. After inserting the support disk and typing any key, the support files will be copied from the floppy disk and distributed to the proper hard drive and subdirectory.

Assuming that no communication errors are detected during transmission of the serialized software, customer's computer 18 receives the appropriate files to implement the electronic catalog system. A sub-directory specified by vendor's computer 12 is created. The initial menu entitled "ECAT" is modified to include the newly downloaded vendor's data. The downloaded files from vendor's computer 12 are distributed to the proper subdirectories of hard disk 36 as illustrated at block 250. Additional support files which may be needed for particular applications may also be downloaded to customer's computer 18. The customer has the option of downloading these files from vendor's computer 12 or of installing these files from support disks. After all support files have been loaded onto the customer's hard disk 36, a message is displayed at: block 250 "ECAT Installation Complete. Please Remove the Floppy Disk and Reboot Your Computer".

Once the electronic catalog (ECAT) program is loaded onto customer's computer 18, the customer is ready to access the catalog information from vendor's computer 12 at any time. The electronic catalog system 10 is initiated by typing "EC MENU" and "ENTER". This brings up the main menu for the electronic catalog system (EC Menu) onto customer's computer 18 as illustrated at block 252 in FIG. 8. Electronic catalog system menu first displays main categories from which the customer may choose to obtain information is illustrated at block 254. These main categories at block 254 include a list of several catalog products from which the customer can choose. A customer enters a selected product and customer's computer 18 reads the selection at block 256. For illustrative purposes, we will assume that the customer has selected to obtain information related to electric motors. It is understood, however, that various other products could be entered or selected depending upon the specific product information stored on customer's computer 18 and vendor's computer 12.

After the customer selects electric motors, customer's computer 18 calls a sub-routine for electric motors at block 258 and displays various categories for inquiries about electric motors at block 260. Customer's computer 18 reads the selected category input at block 262 and decides whether or not a graphical query has been selected at block 264.

If a graphical query is selected, customer's computer 18 provides graphical information to the customer as illustrated at block 266. Illustratively, customer's computer displays drawings of an electric motor since electric motors were earlier selected by the customer. Customer's computer 18 then displays a scrolled box of selection criteria related to design characteristics of electric motors from which the customer can choose. For example, horsepower, FLRPM, voltage, torque, shaft diameter, shaft centerline dimension, etc. can be listed as design criteria. Customer's computer 18 then generates a query based on the selected design criteria. Using the answer provided by the customer, customer's computer 18 generates a list of electric motors which meet the selected design criteria. Customer's computer 18 then displays this generated list to assist the customer with his design.

If a graphical query was not selected, customer's computer 18 determines at block 268 whether or not the category of data sheet generation was selected. If data sheet generation was not selected, customer's computer 18 generates additional selection criteria such as performance data, dimensional data, or the like at block 270.

The present invention is concerned only with data sheet generation illustrated at block 268. Therefore, details of the graphical information in block 266 and the additional selection criteria in block 270 will not be provided. If the customer selects data sheet generation, a screen is displayed on customer's computer 18 that requires input of information as illustrated at block 272. The customer is prompted to enter the model number of the electric motor selected at block 274. Customer's computer 18 reads the input at block 276. Customer's computer 18 determines whether or not the escape key was pressed at block 278. If the escape key was pressed, customer's computer 18 returns to main menu 252 as illustrated at block 280. If the escape key was not pressed, customer's computer 18 compares the model number entered at block 274 with a valid model number table at block 282.

Customer's computer 18 then determines whether the model number entered is a valid number at block 284. If the model number entered is not valid, customer's computer 18 displays an error message at block 286 and waits for another model number to be input. If the correct model number has been entered, customer's computer 18 prompts the customer to enter a mounting position for the electric motor as illustrated at block 288 in FIG. 9. The selected mounting position input is read at block 290. Customer's computer 18 determines whether the escape key was pressed at block 292. If the escape key was pressed, customer's computer 18 exits and returns to main menu 252 as illustrated at block 294. If the escape key was not pressed, customer's computer 18 compares the mounting position entered at block 288 with a mounting position table at block 296. Customer's computer 18 determines whether the mounting position is valid at block 298. If the mounting position is not valid, customer's computer 18 generates an error message at block 300 and prompts the customer to enter a new mounting position. If the mounting position is valid, customer's computer 18 prompts the customer to enter further information at block 302. Specifically, the customer must enter the customer name, customer location, and remarks. Customer's com-

puter 18 reads the information at block 304. Customer's computer 18 again determines whether the escape key was pressed at block 306. If the escape key was pressed, customer's computer 18 exits and returns to main menu 252 as illustrated at block 308.

Once all the data has been input, customer's computer 18 calls the communications and data handling functions as illustrated in block 116 of FIG. 4. The software in FIGS. 4–6 is used to link customer's computer 18 with vendor's computer 12 for both the software downloading and for the downloading of variable and constant catalog data. Customer's computer 18 dials vendor's computer 12 telephone number that was stored in the data file at the time of installation of the software. Messages are provided to inform the user of the status of the system. Communications errors are tested and the process will be aborted if any communications errors are detected as discussed in detail with reference to FIGS. 4–6. Once communication between customer's computer 18 and vendor's computer 12 has been established, vendor's computer 12 will transmit a log on and prompt to customer's computer 18.

After customer's computer 18 and vendor's computer 12 complete the steps illustrated in FIGS. 4–6, vendor's computer 12 performs the steps beginning at location H in FIG. 10A and customer's computer 18 performs the steps beginning at location I in FIG. 10B. Customer's computer 18 changes to the transmit mode and transmits identification information including the revision status of the program or software and the revision status of constant data stored on customer's computer 18 as illustrated in block 310. The program or software revision status provides an indication of the last time the software was updated. The constant data revision status provides an indication of the last time the constant data was updated. Customer's computer 18 then initializes a timer at block 312 and changes to a receive mode at block 314. Vendor's computer 12 receives the identification data from customer's computer 18 at block 315. Vendor's computer 12 then checks to determine whether the identification data is legitimate at block 316. If the identification data is not legitimate, vendor's computer 12 transmits the message "Invalid Registration" to customer's computer 18, hangs up and logs off at block 318. If the identification data indicated that a pirated copy of the serialized program software had been detected, the serial number would be invalidated preventing future access by all copies of the software bearing this serial number. Vendor's computer 12 then transmits the message "Invalid Registration" to customer's computer 18 and hangs up and logs off at block 318. If vendor's computer 12 has not yet received the identification data, vendor's computer 12 determines whether a time out has occurred at block 320. If a time-out has not occurred, vendor's computer 12 waits an additional period of time to receive the identification data by returning to block 316. If a time-out has occurred, vendor's computer 12 hangs up and logs off at block 318.

If the identification data received from customer's computer 18 is legitimate, vendor's computer 12 determines whether the software revision status on customer's computer 18 is current at block 322. The software revision status received from customer's computer 18 is compared with the current revision status of the software on vendor's computer 12. For instance, the revision status could be the revision level of the software. If vendor's computer 12 determines that the software on customer's computer 18 needs to be updated, vendor's computer 12 selects the file or files that need to be transmitted to customer's computer 18 to bring customer's computer 18 up to date with the latest software revision level as illustrated at block 324. The software revision status reflects the status of the ECAT software as well as the support files at customer's computer 18. Vendor's computer 12 compresses the files into a single update file at block 326. If vendor's computer 12 determines that the software on customer's computer 18 is current, a dummy software update file is transmitted at block 340 from vendor's computer 12 to customer's computer 18. In other words, an update file is always transmitted from vendor's computer 12 to customer's computer 18. If a dummy update file is transmitted, no change in the revision status or the files is made at customer's computer 18. If there is a difference in the software revision status between customer's computer 18 and vendor's computer 12, the update file transmitted to customer's computer 18 contains all required update information including a new program or software revision status number.

Customer's computer 18 determines whether a response has been received to the identification data at block 330. If no response has been received, customer's computer 18 determines whether a time-out has occurred at block 332. If a time out has occurred, customer's computer 18 hangs up and exits to the operating system at block 334. If a time out has not occurred, customer's computer 18 waits for an additional period of time to receive a response from vendor's computer 12 by returning to block 330.

Vendor's computer 12 also checks the constant data revision status transmitted from customer's computer 18 to vendor's computer 12 at block 336. The constant data revision status received from customer's computer 18 is compared with the current revision status of the constant data on vendor's computer 12. For instance, the revision status could be the revision level of the constant data. If the revision status of the constant data is not current, vendor's computer 12 compiles updated constant data files at block 338, adds the updated constant data files to the update file block 339, and transmits the update file to customer's computer 18 at block 340. If the constant data revision status is the same as the revision status on vendor's computer 12, vendor's computer 12 does not the add constant data file to the update file. Instead, vendor's computer 12 skips to block 340 and transmits the update file to customer's computer 18. Customer's computer 18 detects the end of the data received from vendor's computer 12 at block 342.

The step of comparing the remote program revision status with the main program revision status in block 322 and the step of comparing the remote constant data revision status with the main constant data revising status in block 336 is a accomplished as follows. Each time the main program or the constant data stored in vendor's computer 12 is revised, al log of all changes that apply to a specific revision is kept. Starting with revision level 0, all software and constant data are the same on vendor's computer 12 and the customer's computer 18. When changes are made on vendor's computer 12 to either the constant data or software, the file names effected by the changes are kept in a revision data base and referenced to the next incremental update. When the revision data is sent from vendor's computer 12 to customer's computer 18, all the updated files are compressed into a single update file. The single update file is then downloaded from the vendor's computer 12 to customer's computer 18 when an update request is made as illustrated at block 340. The update file is uncompressed at block 344 and distributed onto the customer's hard disk 36 into the appropriate subdirectories in blocks 346 and 347.

For illustrative purposes, an example of four revisions is provided below. The data base log of changes is stored in the following format:

Revision Level	File Changed
0	All software and constant data is the same in vendor's computer 12 and customer's computer 18
1	Data file #5
1	Data file #28
1	Program file #2
2	Data file #17
3	Program file #4
4	Data file #5 (second revision)
4	Data file #6

In the illustrated example, a revision level change of **0** to **1** would include changes to Data files **#5** and **#28** and to Program file **#2**. These three files would be compressed into a single update file and transmitted from vendor's computer **12** to customer's computer **18** upon access of the vendor's computer **12** by customer's computer **18** as discussed above. Customer's computer **18** would then replace these three files stored on hard disk **36** with the updated files as discussed below.

If the software and constant data stored on customer's computer **18** is more then one revision level behind the software and constant data stored on vendor's computer **12**, all of the files for all of the revisions that the customer requires to become updated are compressed into a single file and downloaded. Therefore, if a customer has not downloaded data for a period of time, that customer may have missed revisions **1**, **2**, **3** and **4**, when the customer's computer **18** having a revision level of **0** does request data, if the current revision level is **4**, vendor's computer **12** would transmit revisions **1**, **2**, **3** and **4** simultaneously to customer's computer **18**. In other words, Data files **5**, **28**, **17**, **5** (second revision), and **6** as well Program files **2** and **4** would be compressed into a single update file and transmitted from vendor's computer **12** to customer's computer **18**.

Upon receipt of the data from vendor's computer **12**, customer's computer **18** determines if the software update file is a dummy file or if there is valid update information. If valid update information exists, customer's computer **18** will replace and/or modify the file or files affected by the revision. Specifically, customer's computer **18** uncompresses the update files at block **344** and replaces existing files with the updated files. This includes both software updates and constant data updates. Customer's computer **18** replaces stored files with the updated data files and program files received from vendor's computer **12**. After this update, the software on customer's computer **18** and the constant data on customer's computer **18** is updated with the most recent current update available at vendor's computer **12**. the software is updated at block **346** and the constant data is updated at block **347**.

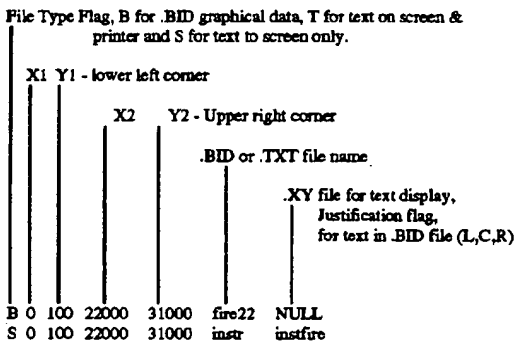
After the software and constant data are updated, customer's computer **18** transmits a variable data request file to vendor's computer **12** at block **348**. Vendor's computer **12** receives the data request file at block **350** and builds a data file for transmission of variable data at block **352**. Vendor's computer **12** transmits the variable data files at block **354** and also transmits a map to permit customer's computer **18** to integrate the variable data with constant data on customer's computer **18** as illustrated at block **356**.

The following is a description of the "map" created by vendor's computer **12** to permit customer's computer **18** to integrate both constant and variable data into a single data sheet. An example for the electric motor data sheet generation is as follows:

The creation of an electric motor data sheet requires the combination of **14** separate data files, displayed graphically, and positioned and scaled properly. These files can be grouped as text or graphical data, and also by whether the files reside locally on the customer's computer **18**, or are downloaded from the vendor's computer **12** each time a data sheet is created. The specific process for generating a data sheet consists of two distinct steps. The first step is to process the data and select or generate the required display files, and the second step is to actually display the data, either on the screen or on a printer. The display files must be in one of two forms, either graphical (<File>.BID), or textual (<File>.TXT) with an accompanying location file (<File>.XY). The files are either downloaded (variable data) from vendor's computer **12**, or are already resident (constant data) on customer's computer **18**. All the files are in the proper format. The exception is the Dimensional Data. Dimensional Data is downloaded as text data, but must be processed to create a graphics file in order to display the borders around the text. A sub-program processes the file FRAME.TMP to create the file FRAME.BID which then becomes one of the graphics files to be displayed. This is an example of parametrics designs.

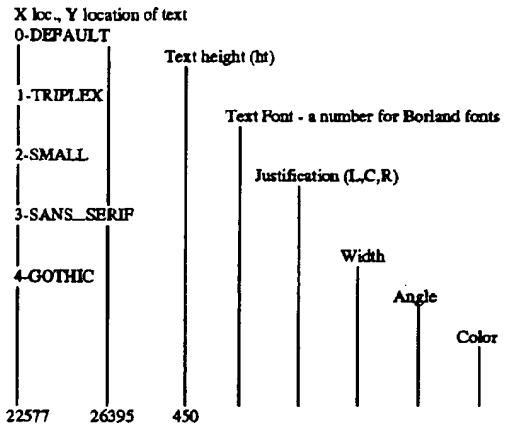
The actual display of the data involves the use of a definition file (<File>.DEF). This file is the "map" that provides the instructions required to integrate all of the data on customer's computer **18**. The definition file is an ASCII text file in which each line of text refers to one specific display file, and the manner in which it is to be displayed. The structure is as follows:

DEFINITION OF "MAP" FILE



For a graphics file, no .XY file is required The format of the .XY file for text display is as follows:

.XY FILE FORMAT



The first 3 fields (x,y,ht) are required, the other fields will default if not defined in the .XY file.

To display a data sheet, the program reads the definition file ("map") one line at a time, calculates a scale factor and positional offsets based on the X1/Y1 and X2/Y2 values listed, and the resolution of the output device. The program then reads and displays the appropriate graphics file (<File>.BID) or text file (<File>.TXT), applying those scale factors and offsets.

After this information is transmitted, vendor's computer **12** automatically logs off and disconnects the data link at block **358**. Customer's computer **18** receives the data files from vendor's computer **12** at block **360**. Customer's computer **18** then automatically disconnects the data link at block **362**.

Customer's computer **18** reads the received variable data at block **364** and integrates the variable data received with the constant data on customer's computer **18** at block **366** according to the map provided by vendor's computer **12**. Customer's computer **18** then builds a data sheet print file at block **368** using the integrated constant data and variable data. Therefore the data sheet includes accurate data having the most recent update included on vendor's computer **12**. At this point, a customer can print a data sheet on printer **24** as illustrated at block **370** or exit back to the main menu at block **372**.

Although the invention has been described in detail with reference to a certain preferred embodiment, variations and modifications exist within the scope and spirit of the invention as described and defined in the following claims.

What is claimed is:

1. A method for accessing product information data related to a selected product stored in a vendor's main computer from a customer's remote computer, the method comprising:

storing product data including graphics data and textual data related to a plurality of products in a memory of the main computer;

storing a first subset of product data including graphics data related to at least one of the plurality of products in a memory of the remote computer;

selecting at least one product at the remote computer;

transmitting a data request query related to the at least one selected product from the remote computer to the main computer;

identifying a second subset of product data including graphics data and textual data related to the selected product from the product data stored in the memory of the main computer based on the data request query;

transmitting the textual data from second subset of product data from the main computer to the remote computer;

transmitting only updated graphics data from the second subset of product data that is different from the graphics data in the first subset of product data from the main computer to the remote computer;

storing the updated graphics data in the memory of the remote computer; and

combining the textual data from the second subset of product data received from the main computer with graphics data related to the selected product stored in the memory of the remote computer to provide complete product information data related to the selected product including both graphics and textual data.

2. The method of claim **1**, further comprising displaying the complete product information data at the remote computer.

3. The method of claim **1**, further comprising transmitting a map from the main computer to the remote computer along with the second subset of product data to permit the remote computer to perform the combining step.

4. The method of claim **1**, further comprising automatically establishing a data link between the remote computer and the main computer after the selecting step.

5. The method of claim **4**, further comprising automatically disconnecting the data link between the remote computer and the main computer after the second subset of product data is transmitted from the main computer to the remote computer.

6. The method of claim **1**, further comprising compressing the data request query at the remote computer prior to the transmitting the data request query to the main computer and uncompressing the data request query at the main computer.

7. The method of claim **1**, further comprising compressing the second subset of product data at the main computer prior to transmitting the second subset of product data from the main computer to the remote computer, and uncompressing the second subset of product data at the remote computer.

8. A method for accessing product information related to a selected product stored in a vendor's main computer from a customer's remote computer, the method comprising:

storing and maintaining product data including graphics data and textual data related to a plurality of products in a memory of the main computer;

storing a first subset of product data related to at least one of the plurality of products in a memory of the remote computer;

selecting at least one product at the remote computer;

generating a data request query related to the at least one selected product at the remote computer;

generating identification data at the remote computer;

transmitting the data request query and the identification data from the remote computer to the main computer;

interpreting the identification data at the main computer and selecting a program at the main computer to be executed;

executing the data request query using the selected program at the main computer to generate a second subset of product data related to the at least one selected product from the product data stored in the memory of the main computer;

transmitting the second subset of the product data from the main computer to the remote computer along with a map to instruct the remote computer regarding integrating the second subset of product data received from the main computer with the first subset of product data stored in the memory of the remote computer; and

integrating a second subset of product data received from the main computer with the first subset of product data related to the selected product stored in the memory of the remote computer to provide a combined set of product information data at the remote computer.

9. The method of claim **8**, further comprising displaying the combined set of product data at the remote computer.

10. The method of claim **8**, further comprising automatically establishing a data link between the remote computer and the main computer after generating the identification data and the data request query.

11. The method of claim **10**, further comprising testing the identification data received by the main computer for validity, the main computer automatically disconnecting the data link from the remote computer if the identification data is invalid.

12. The method of claim **10**, further comprising automatically disconnecting the communication link between the remote computer and the main computer after the second subset of product data is received by the remote computer from the main computer.

13. The method of claim **8**, wherein the first subset of product data includes graphics data and the second subset of product data includes graphics data and textual data related to the selected product, and wherein the step of transmitting the second subset of the product data from the main computer to the remote computer includes transmitting textual data from second subset of product data from the main computer to the remote computer and transmitting only updated graphics data from the second subset of product data from the main computer to the remote computer.

14. The method of claim **13**, further comprising storing the updated graphics data received from the main computer in the memory of the remote computer.

15. The method of claim **14**, wherein the integrating step includes combining the textual data of second subset of product data received from the main computer with graphics data related to the selected product stored in the memory of the remote computer to provide the combined set of product information related to the selected product including both graphics and textual data.

16. A method for accessing product information data related to a selected product stored in a vendor's main computer from a customer's remote computer, the method comprising:

storing product data including constant data and variable data related to a plurality of products in a memory of the main computer;

storing a first subset of product data including constant data related to at least one of the plurality of products in a memory of the remote computer;

selecting at least one product at the remote computer;

transmitting a data request query related to the at least one selected product from the remote computer to the main computer;

identifying a second subset of product data including constant and variable data related to the selected product from the product data stored in the memory of the main computer based on the data request query;

transmitting variable data from second subset of product data from the main computer to the remote computer;

transmitting only updated constant data from the second subset of product data that is different from the constant data in the first subset of product data from the main computer to the remote computer;

storing the updated constant data in the memory of the remote computer; and

combining the variable data received from the main computer with constant data related to the selected product stored in the memory of the remote computer to provide complete product information related to the selected product.

17. The method of claim **16**, further comprising displaying the complete product information at the remote computer.

18. The method of claim **16**, further comprising transmitting a map from the main computer to the remote computer along with the second subset of product data related to the selected product to permit the remote computer to perform the combining step.

19. The method of claim **16**, further comprising automatically establishing a data link between the remote computer and the main computer after the selecting step, and automatically disconnecting the data link between the remote computer and the main computer after the second subset of product data is transmitted from the main computer to the remote computer.

20. The method of claim **16**, wherein the constant data includes high resolution graphics data and the variable data includes textual data.

* * * * *

US006107961A

United States Patent [19]

Takagi

[11] **Patent Number: 6,107,961**

[45] **Date of Patent: Aug. 22, 2000**

[54] **MAP DISPLAY SYSTEM**

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[73] Assignee: **Kokusai Denshin Denwa Co., Ltd.**, Tokyo, Japan

[21] Appl. No.: **09/028,484**

[22] Filed: **Feb. 24, 1998**

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[51] **Int. Cl.**[7] **G01S 7/185**

[52] **U.S. Cl.** **342/357.13**; 701/208; 340/990; 340/995

[58] **Field of Search** 342/357.13; 701/208, 701/212; 340/990, 995

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[57] **ABSTRACT**

A map display system includes a plurality of geographic information servers, a geographic information search server and clients, connected to each other through network. The geographic information search server searches a plurality of geographic information servers and generates a combination list containing information of existential place of the plurality of geographic information servers. The clients obtain a plurality of geographic information from the plurality of geographic information servers designated by the combination list and display the obtained plurality of geographic information while superimposing them so that the coordinates thereof coincide each other on the same screen.

10 Claims, 7 Drawing Sheets

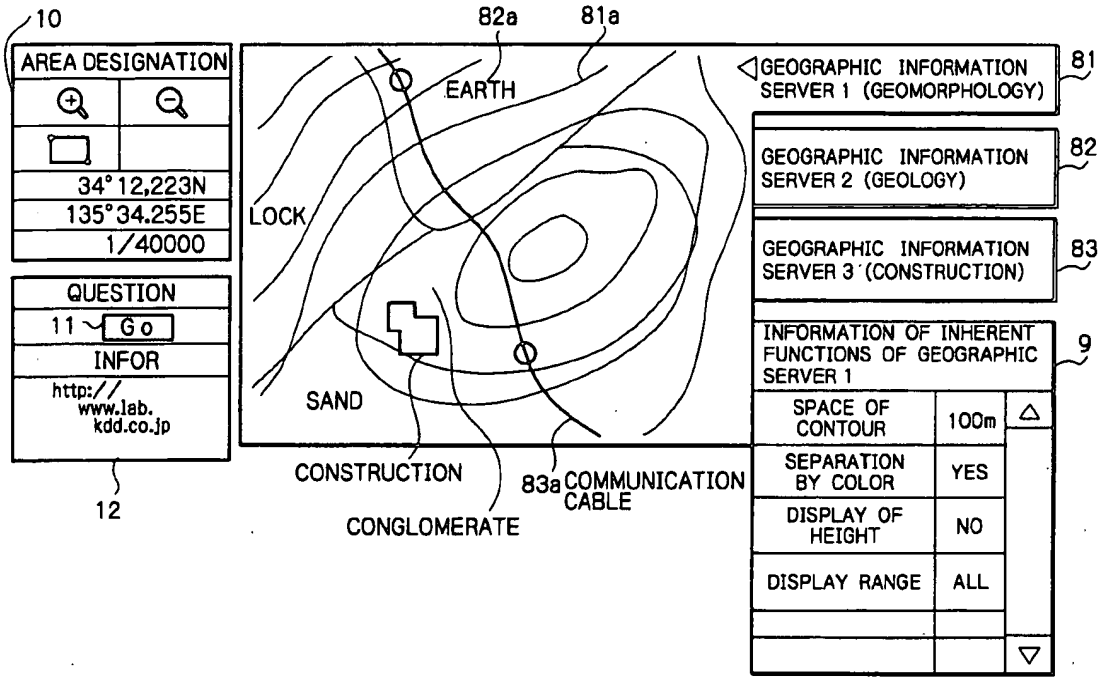


Fig. 1A

Fig. 1

Fig. 1A	Fig. 1B

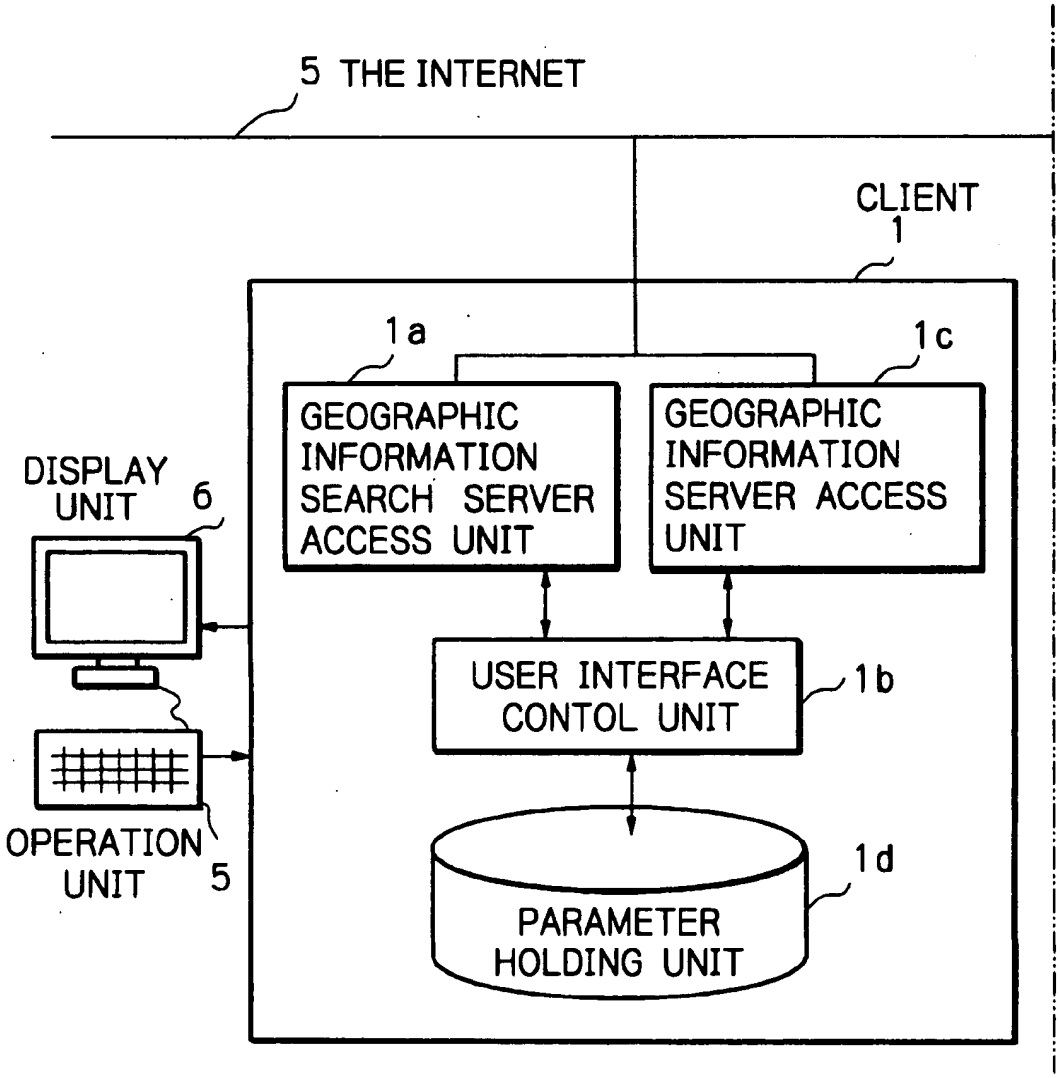


Fig. 1B

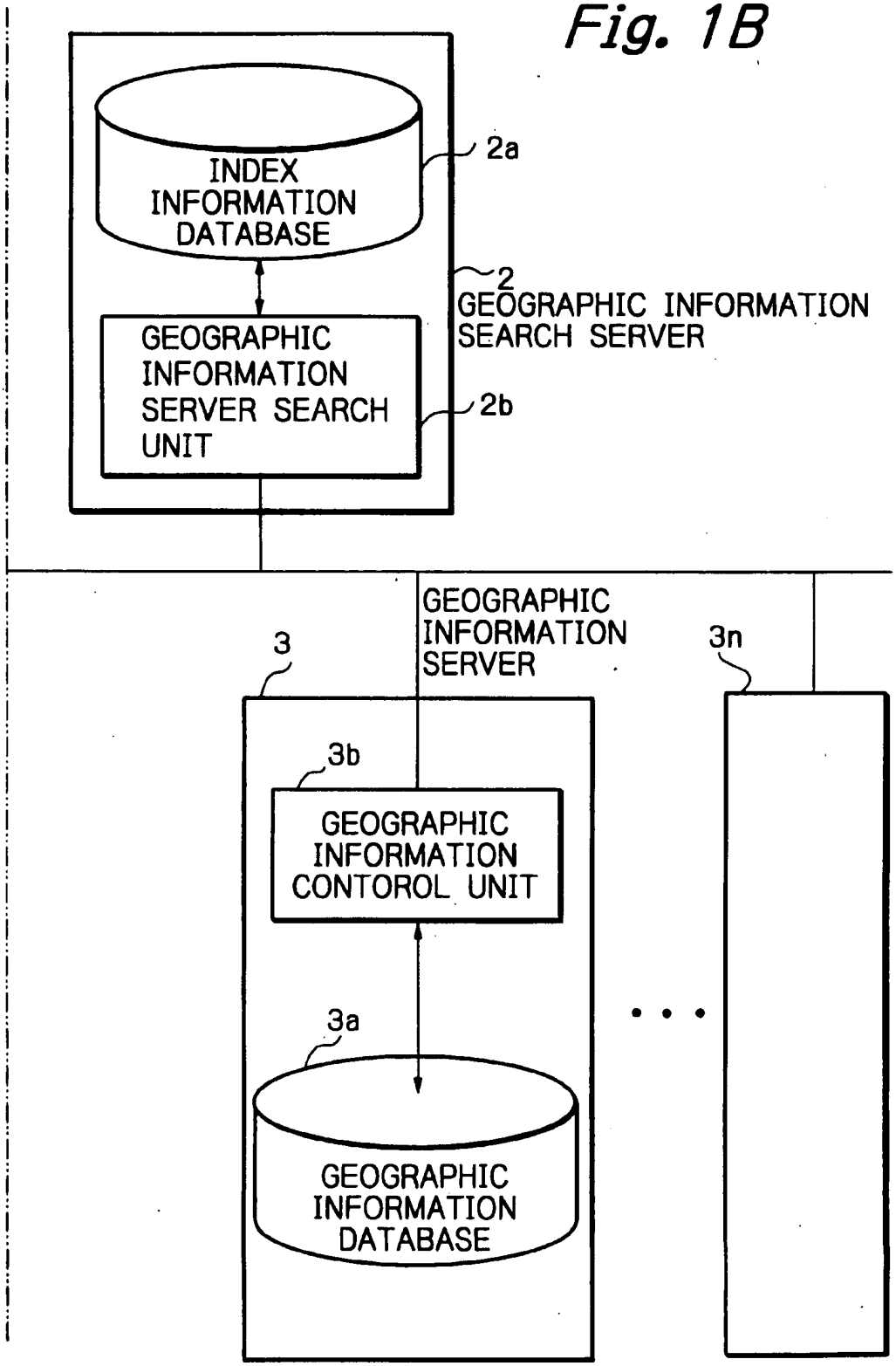

INDEX INFORMATION DATABASE
2a
2
GEOGRAPHIC INFORMATION SEARCH SERVER
GEOGRAPHIC INFORMATION SERVER SEARCH UNIT
2b
GEOGRAPHIC INFORMATION SERVER
3
3n
3b
GEOGRAPHIC INFORMATION CONTOROL UNIT
3a
GEOGRAPHIC INFORMATION DATABASE

Fig. 2

Fig. 2A	Fig. 2B	Fig. 2C

Fig. 2A

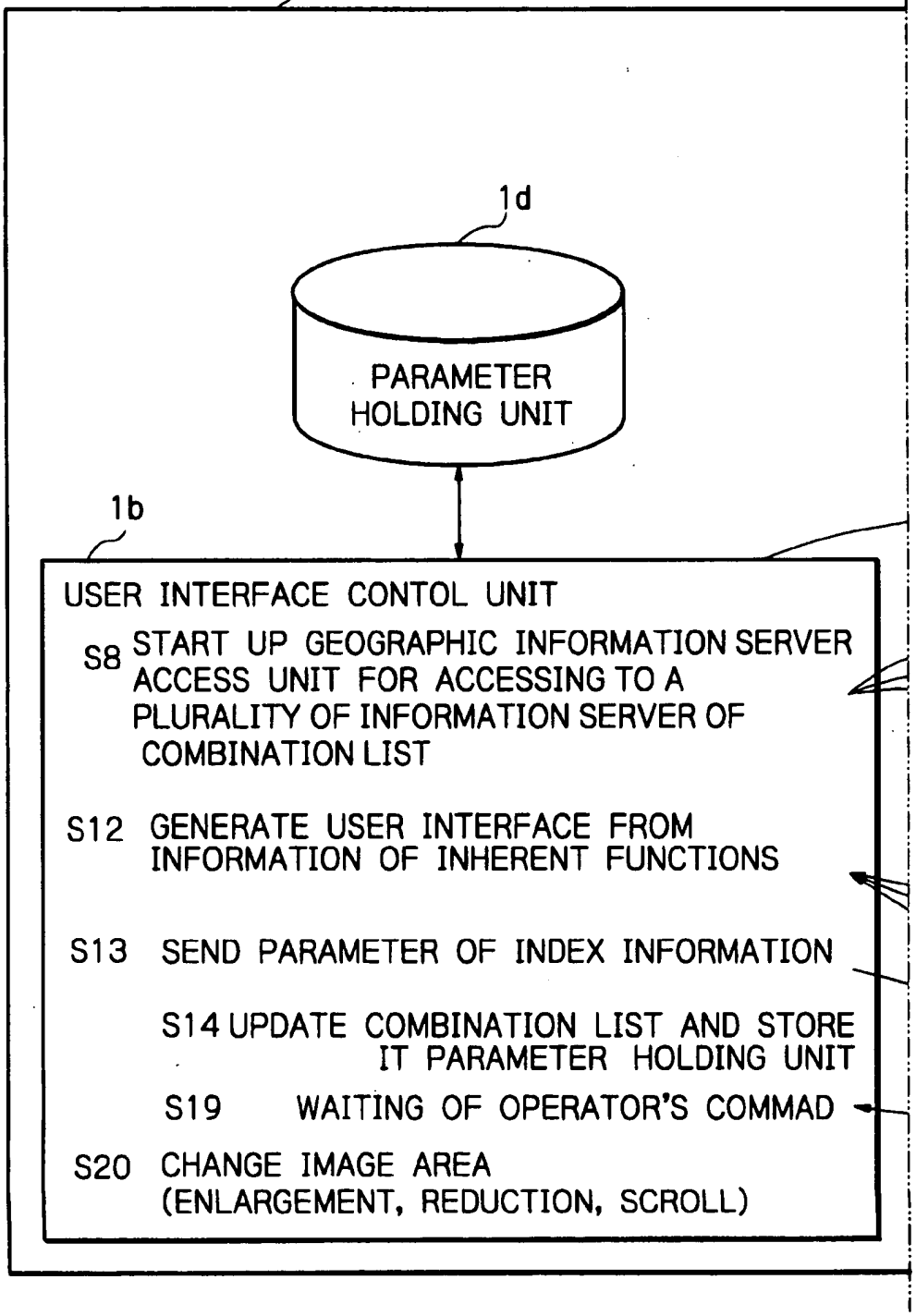


Fig. 2B

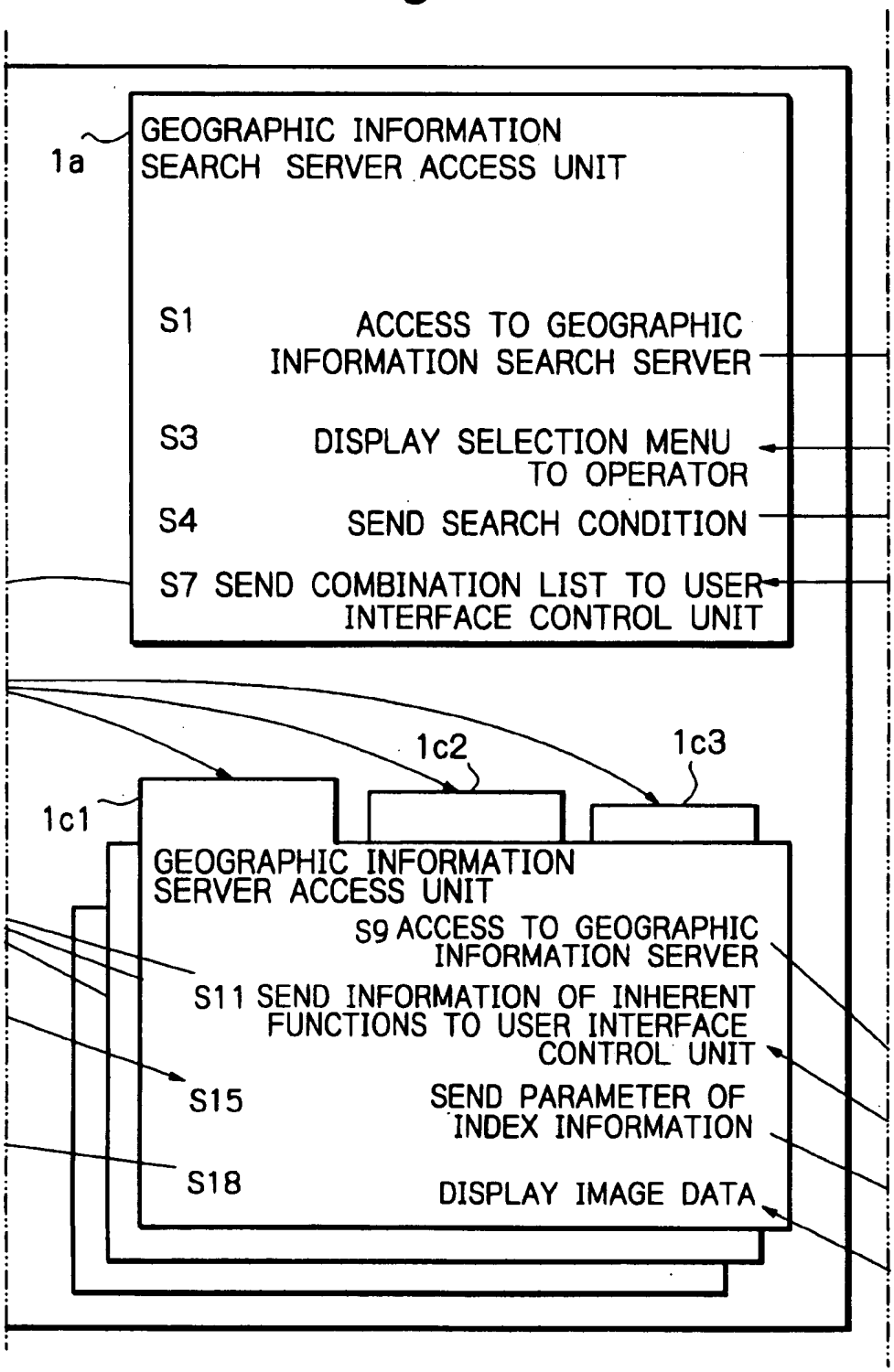
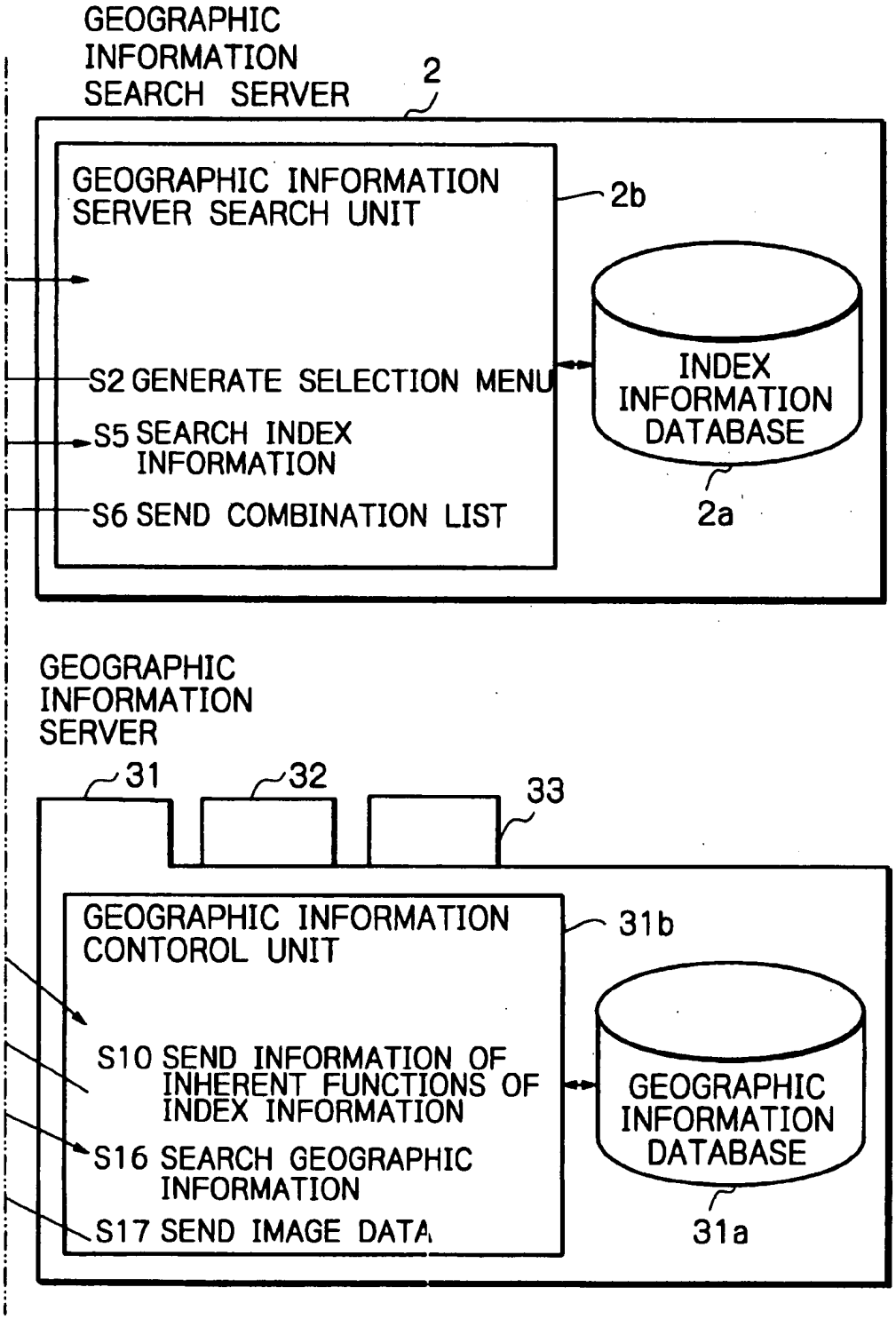

1a
GEOGRAPHIC INFORMATION SEARCH SERVER ACCESS UNIT
S1 ACCESS TO GEOGRAPHIC INFORMATION SEARCH SERVER
S3 DISPLAY SELECTION MENU TO OPERATOR
S4 SEND SEARCH CONDITION
S7 SEND COMBINATION LIST TO USER INTERFACE CONTROL UNIT
1c1
1c2
1c3
GEOGRAPHIC INFORMATION SERVER ACCESS UNIT
S9 ACCESS TO GEOGRAPHIC INFORMATION SERVER
S11 SEND INFORMATION OF INHERENT FUNCTIONS TO USER INTERFACE CONTROL UNIT
S15 SEND PARAMETER OF INDEX INFORMATION
S18 DISPLAY IMAGE DATA

Fig. 2C


GEOGRAPHIC INFORMATION SEARCH SERVER
2
GEOGRAPHIC INFORMATION SERVER SEARCH UNIT
2b
S2 GENERATE SELECTION MENU
S5 SEARCH INDEX INFORMATION
S6 SEND COMBINATION LIST
INDEX INFORMATION DATABASE
2a
GEOGRAPHIC INFORMATION SERVER
31
32
33
GEOGRAPHIC INFORMATION CONTOROL UNIT
31b
S10 SEND INFORMATION OF INHERENT FUNCTIONS OF INDEX INFORMATION
S16 SEARCH GEOGRAPHIC INFORMATION
S17 SEND IMAGE DATA
GEOGRAPHIC INFORMATION DATABASE
31a

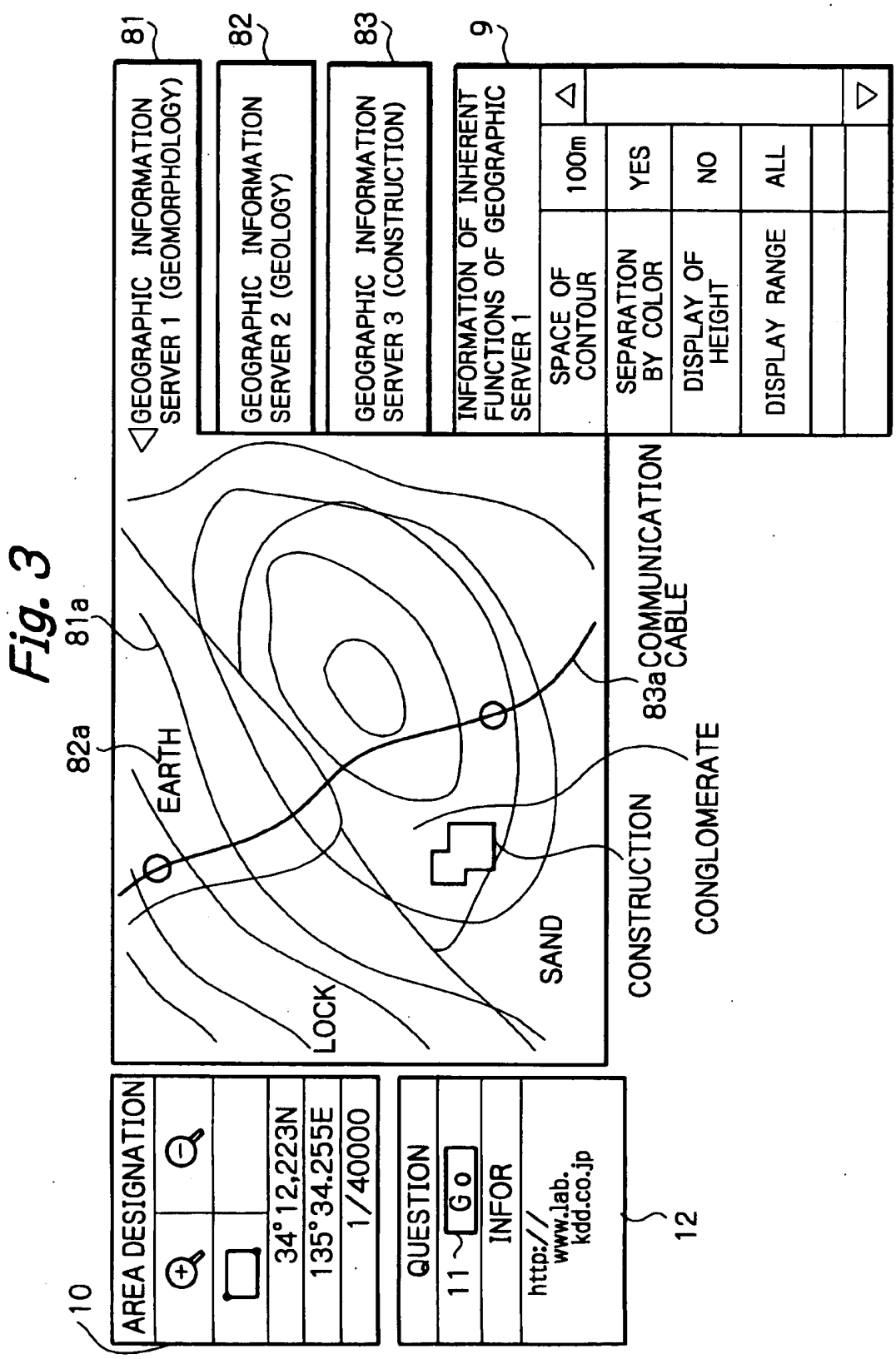
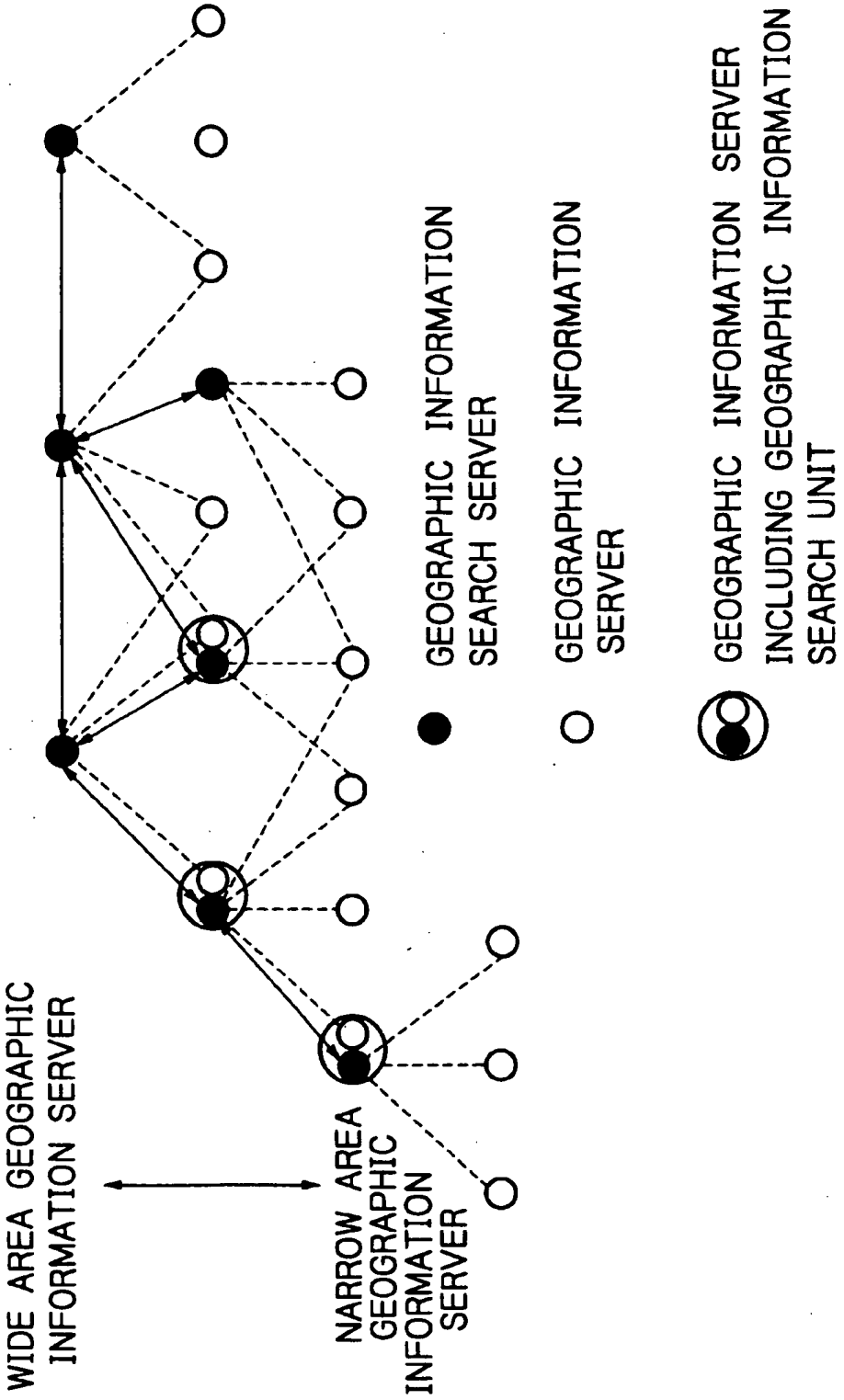

81
82
83
9
GEOGRAPHIC INFORMATION SERVER 1 (GEOMORPHOLOGY)
GEOGRAPHIC INFORMATION SERVER 2 (GEOLOGY)
GEOGRAPHIC INFORMATION SERVER 3 (CONSTRUCTION)
INFORMATION OF INHERENT FUNCTIONS OF GEOGRAPHIC SERVER 1
SPACE OF CONTOUR
100m
SEPARATION BY COLOR
YES
DISPLAY OF HEIGHT
NO
DISPLAY RANGE
ALL
81a
82a
EARTH
LOCK
SAND
CONSTRUCTION
CONGLOMERATE
83a COMMUNICATION CABLE
10
AREA DESIGNATION
34°12,223N
135°34.255E
1/40000
QUESTION
11
Go
INFOR
http://www.lab.kdd.co.jp
12

Fig. 3

Fig. 4


WIDE AREA GEOGRAPHIC INFORMATION SERVER
NARROW AREA GEOGRAPHIC INFORMATION SERVER
GEOGRAPHIC INFORMATION SEARCH SERVER
GEOGRAPHIC INFORMATION SERVER
GEOGRAPHIC INFORMATION SERVER INCLUDING GEOGRAPHIC INFORMATION SEARCH UNIT

MAP DISPLAY SYSTEM

FIELD OF THE INVENTION

The present invention relates to a map display system which can display geographic information in computers on a wide area network to a client.

DESCRIPTION OF THE RELATED ART

In a conventional map display geographic information system, many systems are used as stand-alone configurations, for example, such as a car navigation system.

In the car navigation system, a single storage medium contains recorded position information such as roads and shopping areas and the like while a map range, which corresponds to a region which can be displayed, is previously limited. In the displayed map, an operator can select display information.

Further, there is a system in which a single geographic information server is connected to internet, thus the geographic information is provided to an unspecified number of clients.

However, the conventional geographic information is provided from one medium or a server at one place. Particularly, various kinds of geographic information servers existing on the internet are not linked to each other as a geographic information system, but they are isolated respectively.

Thus, when a client searches one geographic information server, a client must again connect to another geographic information server for searching geographic information of an area portion provided by the server. For example, if a client intends to search the town level road information during the searching of a geographic information server which was specialized in country level road information, a client must change the connection from the first server to connection to another geographic information server which is specialized in the town level road information. Furthermore, if a client intends to search position information of shopping areas, one must change the connection to the server to connection to another geographic information server which is specialized in that particular information.

In order to overcome such disadvantages, it is considered that one geographic information server is linked to a plurality of geographic information servers to provide one integrated geographic information to a client.

However, it is not technically possible to link geographic information at the data level if the link between geographic information servers is not based on the same specification. Therefore it is very difficult to link between geographic information servers based on the existing different specifications.

SUMMARY OF THE INVENTION

Therefore, an object of the present invention is to provide a map display system in which a client can display various geographic information with a plurality of geographic information servers on the network.

The present invention provides a map display system including a plurality of geographic information servers, a geographic information search server searching the geographic information servers and clients displaying a map, connected to each other through a network, and displaying geographic information in the geographic information servers by the clients. The geographic information search server

includes an index information database containing index information of geographic information provided by each geographic information server, and a geographic information server search unit searching a plurality of geographic information servers and generating a combination list containing location information of the plurality of geographic information servers. The clients include a geographic information search server access unit for obtaining the combination list, a geographic information server access unit for obtaining a plurality of geographic information from the plurality of geographic information servers designated by the combination list and an user interface control unit for displaying the obtained plurality of geographic information while superimposing them so that the coordinates thereof coincide with each other on the same screen. Thus, the client in map display system can display geographic information in all of the geographic information server on network.

According to an embodiment of the invention, the index information include information of an image range common to all of the geographic information servers and information of specific functions of each of the geographic information servers.

According to an embodiment of the invention, the information of image range of the index information includes items of a name of district of the geographic information, display range, display contents and maximum and minimum scales.

Thus, the client can clearly know the geographic information possible provided by each geographic information server.

According to an embodiment of the invention, the combination list further comprises a parameter for the information of image range and a parameter for the information of specific functions. Thus, the geographic information server can generate image data in accordance with parameters in the index information.

According to an embodiment of the invention, the geographic information servers includes a geographic information database containing the geographic information and a geographic information control unit for searching the geographic information by using the geographic information database, and the geographic information control unit converts the geographic information into image data of a standard graphics data format and sends the image data to the clients. Thus, a client can easily display a plurality of image data at an image level while superimposing the data. Further, even if the geographic information is image data in the raster image data format, a client can the geographic information as image data in background or utilize it while superimposing an image having transparent attributes.

Since the image data is in a standard graphics data format and the client executes only an image operation, the client's software can easily access the data and render the image. And since the logical structure data possessed by the serves not stolen taken from the network, the security is high.

The number of coordinate systems for indicating a position of an object may be one. Thus, the client can easily superimpose the maps provided by different servers.

The client may convert image data with one coordinate system to image data with another coordinate. Thus, if the coordinate is not unified, the client can superimpose the maps. In addition, the parameter of combination list may include converting parameters for converting image data.

According to an embodiment of the invention, the geographic information control unit generates the image data in accordance with a parameter based on the index information

commanded by the clients. Thus, the client need not generate and process the image data.

According to an embodiment of the invention, the geographic information control unit previously sends information of inherent functions in the index information possible provided the unit itself to the clients. In a user interface control unit, a user interface which can be selected by an operator for items of specific functions of index information can be generated. Thus, a parameter of a combination list previously received from a geographic information search server can be changed on a client side and the client can directly command the parameter to a geographic information server.

According to an embodiment of the invention, the clients further comprise a parameter holding unit storing parameters based on the index information. Thus, since the client can cut the connection to the geographic information server at the time when reception of image data has been completed, the geographic information server does not need to have a parameter holding region to the access from a unspecified number of clients. It is desirable that image data sent by the geographic information server furthermore has link information to other servers. Thus, the same functions as that of hyperlink in WWW and of a clickable map can be implemented.

According to an embodiment of the invention, the geographic information search server access unit in the client accesses the geographic information search servers in order that the clients obtain the combination list again when a map outside the range of the index information is demanded. When a client demands to search geographic information no provided by the geographic information server, the server can notice the fact that the demanded area is outside the possible display area to the client.

According to an embodiment of the invention, the geographic information servers further include the index information database and the geographic information server search unit. The geographic information server search unit is constituted so that when a map outside the range of the index information is demanded, the server search unit searches the corresponding other geographic information servers by using the index information database, generates the combination list, and sends the list to the clients. Thus, the client can display the display condition in common with all of geographic information servers. Further, since specific functions of the geographic information servers are also used with an integrated user interface unit, a seamless operational environment for search and display can be provided.

According to an embodiment of the invention, the geographic information server further includes the geographic information server access unit and obtains geographic information from a designated other geographic information servers by using the geographic information server access unit in accordance with the combination list. The geographic information server including the geographic information server access unit can send the combination list including items provided by only the other geographic information server although it have no contents of image data. Further, by this function, the servers can be hierarchically formed, whereby a more efficient group of geographic servers can be provided.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1A and 1B show a block diagram of the map display system according to a preferred embodiment of the present invention;

FIGS. 2A–2C show a sequence diagram of FIG. 1;

FIG. 3 shows an image display displayed by a client in FIG. 1; and

FIG. 4 shows a hierarchical tree structure of the geographic information servers and geographic information search servers in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred one embodiment of the present invention will now be described with reference to the drawings.

As shown in FIG. 1, in the map display system, a plurality of geographic information servers **3**, a geographic information search server, **2** searching the geographic information server and a client **1** displaying a map are connected to each other through a network such as internet **5**.

The geographic information server **3** includes a geographic information database **3***a* storing geographic information and a geographic information control unit **3***b* converting the geographic information to image data and sending the information to a client **1**.

The geographic information control unit **3***b* effects functions of the searching of a geographic information from the geographic information database **3***a*, the generation of a geographic information in accordance with the parameters of index information, the conversion of the geographic information to image data and the transmission of the image data to clients.

The image data is embodied as a standard graphics data format such as POST SCRIPT (Trademark of Adobe System Inc.). In order to utilize the existing geographic information system with different specifications, the geographic information control unit **3***b* converts geographic information to the image data, thereby absorbing differences of the specifications of the geographic information. This function of conversion can be provided as a middleware, thereby can be relatively easily mounted on many existing geographic information systems.

The coordinate system for indicating image position of image object employs a coordinate system unifying an origin position and a scale. For example, the coordinate system could be the positioning system WGS-84 used in GPS (Global Positioning System).

If the coordinate system is not unified, the client can superimpose the maps by converting image data with one coordinate system to image data with another coordinate.

Further, the display of an image is performed on an appropriate scale in accordance with scaling up or scaling down based on the parameter of the display range of the index information. For example, in a scaled-up map, even narrow roads can be displayed, while in a scaled-down map, only main roads can be displayed.

The index information includes common items in the whole geographic information servers, and items of specific functions in each geographic information server. The common items include the names of areas or districts, the range of display, the contents of display and the maximum or minimum scale. Parameters can be designated with respect to the respective items.

Further, when a geographic information server is accessed from a client, it sends items of specific functions of index information possible provided by server itself. Thus, the client can display selectable user interfaces for an operator.

Therefore, the operator can understand the range of geographic information possible provided by the geographic information server, and can directly command the change of parameters.

The geographic information server **3** is concretely implemented by adding functions to the WWW server. The communication protocol between the geographic information server **3** and the client **1** is implemented in a form based on the HTTP (Hyper Text Transfer Protocol).

The geographic information search server **2** includes an index information database **2***a* including index information and a geographic information server search unit **2***b* generating a combination list of a plurality of geographic information servers.

The index information database **2***a* stores index information possible provided by geographic information server itself every geographic information server.

The geographic information server search unit **2***b* determines combination of a plurality of geographic information servers most suitable for the search condition by clients, parameters based on items of specific functions of the geographic information servers in index information and parameters based on common items of the whole geographic information servers in index information.

The geographic information search server **2** sends the combination list of these determined information to clients.

A form of a combination list will be described below.

```
MRL {
        URL of a geographic information server 1
        + parameter of information of inherent
              functions of the server 1;
        URL of a geographic information server 2
        + parameter of information of inherent
              functions of the server 2;
        URL of a geographic information server 3
        + parameter of information of inherent
              functions of the server 3;
} parameter of the information of image range;
```

The above-mentioned URL (Uniform Resource Locator) designates address of geographic information of geographic information servers. Further, the parameters are information of specific functions of index information possible displayed by the geographic information server.

The combination of a plurality of geographic information servers, which is most optimal to display, is called as MRL (Multiple Resource Locator).

Additionally, the MRL are included parameters of information of image range which are common to geographic information servers.

In an embodiment, the geographic information search server **2** is expansion of functions of the server of WWW.

The client **1** has a geographic information search server access unit **1***a*, a geographic information server access unit **1***c*, a user interface control unit **1***b* and parameter holding unit **1***d*.

The geographic information search server access unit **1***a* is a unit for obtaining a combination list. The geographic information search server access unit **1***a* sends the search condition to the geographic information search server **2** and receives a combination list of the geographic information server **3** from the geographic information search server **2**. After that, the geographic information search server access unit **1***a* sends the combination list to the user interface control unit **1***b*. The geographic information search server access unit **1***a* can be relatively easily implemented by a WWW browser.

The geographic information server access unit **1***c* obtains a plurality of geographic information from a plurality of a geographic information server and displays the obtained geographic information on a display unit **6** while superimposing the information with the coordinates coincided with each other. Each of geographic information server access unit **1***c* corresponds to each of geographic information servers **3***n* respectively. Also, the geographic information server access unit **1***c* obtains URL sent from the user interface control unit **1***b* and sends a parameter of index information to the corresponding geographic information server **3**. Thus, geographic information server access unit **1***c* receives information of specific functions of index information and image data based on the post script format from the geographic information server **3***n*, and sends these information to the user interface control unit **1***b* and the display unit **6**.

The user interface control unit **1***b* is a unit for controlling the geographic information server access unit **1***c* in accordance with command from an operator and information from the geographic information search server access unit **1***a*. The user interface control unit **1***b* separates the combination list received from the geographic information search server access unit **1***a* into URL of every geographic information server **3***n*. Then, the user interface control unit **1***b* sends the parameters of information of inherent functions of the respective geographic information servers and the parameters of information within a range of image common to the whole geographic information servers **3***n*, to the respective geographic information server access unit **1***c*. Further, the user interface control unit **1***b* provides an operator with user interface of functions of servers, such as a text input column or button, in accordance with items of specific information of index information. That is, the user interface control unit **1***b* performs display of a selector button, generation of selection, generation of a text input area, generation of a coordinate input requiring item and transmission of the fact that the above-mentioned factors have been operated by an operator to servers. For example, the user interface control unit **1***b* effects the same functions as the browser in WWW. All of the actual processing is carried out on a geographic information server's side.

The parameter holding unit **1***d* stores a display state or the like of a client. The parameter holding unit id stores a combination list and information of specific functions of each geographic information server. The existing parameter state with respect to information of specific functions of index information is updated in parameter of information of specific functions of the combination list. Further, the existing parameter state with respect to information of existing image range is also updated in parameter of information of image range of the combination list. As a result, since the connection to the geographic information server **3** can be cut at the time when reception of image data has been completed, the geographic information server **3** does not need to have a parameter saving area with respect to access from an unspecified number of clients.

FIG. **2** is a sequence diagram of FIG. **1**.

First, the sequence between a geographic information search server access unit **1***a* of the client **1** and a geographic information search server **2** will be described.

When a demand for a map display is generated in client **1**, the geographic information search server access unit **1***a* has access to the geographic information search server **2** (S1).

The geographic Information server search unit **2***b* of the accessed geographic information server **2** generates a selection menu and sends it to a client **1** (S2).

The geographic information search server access unit **1***a* of the client **1** displays the received selection menu to an operator (S3). After that, the geographic information search server access unit **1***a* waits for a command from the operator and sends a search condition based on the command to the geographic information search server **2** (S4).

The geographic information server search unit **2***b* which received the search condition searches using the index information database **2***a* (S5). As a result of the search, a combination list which stored a plurality of geographic information server which is suited for the condition and the parameter with respective to the index information is sent to the client **1** (S6).

The geographic information search server access unit **1***a* which received the combination list sends the combination list to the user interface control unit **1***b* (S7).

Next, sequence between of the user interface control unit **1***b* of the client **1** and the geographic information server access unit **1***c*, and the geographic information server **3** will be described.

In order to have simultaneous access to a plurality of geographic information servers **31**, **32** and **33** of the combination list, the user interface control unit **1***b* generates a plurality of geographic information server access units **1***c***1**, **1***c***2** and **1***c***3** and starts up (S8). This procedure is the same procedure as the parent process generating a plurality of the child processes.

The generated geographic information server access unit **1***c* accesses to the corresponding geographic information server **3** (S9). The geographic information server access unit **1***c***1** corresponds to the geographic information server **31**, the geographic information server access unit **1***c***2** corresponds to the geographic information server **32**, and the geographic information server access unit **1***c***3** corresponds to the geographic information server **33**, respectively. In this case, as an example, the sequence of the geographic information server **31** will now be described. Both the geographic information servers **32** and **33** also have the same constitution and sequence.

A geographic information control unit **31***b* of the accessed geographic information server **31** sends information of specific functions of index information possible previously provided by the control unit itself (S10).

The geographic information server access unit **1***c***1** of the client **1** received sends the information of specific functions from the geographic information server **31** (S11). The information of specific functions of index information may be previously received from the geographic information search server **2**. Further, the combination list received from the geographic information search server **2** includes only URL of a plurality of geographic information servers and information of common image range and can also receive the information of specific functions in S11.

The user interface control unit **1***b* generates a user interface for controlling a map image, such as a text field and a button, in accordance with a plurality of received information of inherent functions (S12). Further, the user interface control unit **1***b* displays only one setting button for information of image range common to the all of the geographic information servers in index information.

Then, the user interface control unit **1***b* separates the combination list every geographic information search server. And, the control unit **1***b* sends the parameters of index information to the respectively corresponding geographic information server access unit (S13).

In the first display the user interface control unit **1***b* sends the parameter to all of the geographic information server access unit **1***c*. However, after that, the control unit **1***b* sends the parameter to only a geographic information server in which parameter was changed. Consequently, the transmission of image data from the geographic information server which does not need to image can be omitted.

Then, a parameter state of index information to be displayed is stored in the parameter holding unit **1***d* every combination list (S14).

The geographic information server access unit **1***c***1** receiving parameter of index information sends the parameter of the index information to a corresponding geographic information server **31** (S15).

A geographic information control unit **31***b* of the geographic information server **31** which received the parameter of index information searches geographic information from a geographic information database **31***a* in accordance with the parameter (S16). The searched geographic information generates geographic information in accordance with the parameter. After that, the geographic information control unit **31***b* converts the geographic information to image data and sends the image data to a client (S17).

The geographic information server access unit **101** which received image data displays the image data superimposed on the same coordinate on the same window of a display unit **6** together with other server access unit (S18). The geographic information server access unit **1***c***1** has the map forming process (cartography) for displaying image data of a graphics data format.

Then the client **1** waits for a command from an operator (S19). After that, when change of image range (enlargement, reduction and scroll and the like) is commanded, a parameter of the information of the corresponding image range is changed (S20). Then the operations from S13 to S20 are repeated.

When the command of the operator exceeds the range of information of the image range, the user interface control unit **1***b* can again obtain the combination list of the plurality of geographic information server **3** through the geographic information search access unit **1***a*.

FIG. **3** shows an image display displayed by a user interface control unit **1***b* and a geographic information server access unit **1***c*. In this display, all information of a geographic information server with geomorphologic information, a geographic information server with geologic information and a geographic information server with construction information is displayed while being superimposed on the same coordinates. The geographic information server of the geomorphologic information provides image data of contour lines (geomorphology) **81***a*, the geographic information server of the geologic information provides image data of sand (geology) **82***a*, and the geographic information server of construction information provides image data of communication cables (construction) **83***a*, respectively.

Tabs **81**, **82** and **83** corresponding to the respective geographic information servers are displayed in FIG. **3**. When any one of these tabs is selected, the item **9** for information of an inherent function of the selected geographic information server is displayed and the parameter in the item **9** can be changed.

Further, in the area designating user interface **10**, the parameter of information of image range common to all servers can be displayed and changed.

Further, there is displayed a clickable pointer **10**, and enlargement and reduction of map can be easily performed by operating an operating unit **7** such as a mouse or the like.

GO button **11** can access to the geographic information search server **2** by operator's command.

Further, URL information **12** displays URL of the geographic information server included in information of image data pointed to a map by using a mouse pointer. The geographic information of the geographic information server can be displayed by using GO button **11**. Thus, the function generally designated as a clickable map in WWW can be implemented.

Graphics to be imaged can have linkage to data of other servers which correspond to hyperlink in WWW, as a clickable map. Further, the index information stored in the geographic information search servers can be treated as one kind of geographic information since it includes the location information of the geographic information server and information of image range such as display area, display contents and the like.

Accordingly, another embodiment of the present invention, in which functions of a geographic information search server are included in a geographic information server, and an operation environment which is seamless between search and display is provided, will be described in detail below.

The geographic information server including geographic information server search unit is one that includes an index information database and geographic information server search unit and a geographic information server access unit. Even though a range outside the index information possible provided by the geographic information server is desired, the geographic information server search unit searches the corresponding other geographic information servers using an index information database, obtains geographic information from the searched other geographic information servers using a geographic information server access unit and sends the obtained geographic information to a client by the geographic information control unit.

The geographic information server used as such geographic information search server will be able to add the MRL to linkage information added to each object of image data.

Further, by forming the whole image data as one large graphics object, the MRL can be added to the object as linkage information.

The structure of image data will be showed below.

```
[Image data]:MRL{
  [Road]:MRL{
    [Road1]:MRL{URL1+Info1,URL2+Info2,URL3+Info3}
    [Road2]:MRL{URL1+Info1,URL2+Info2,URL3+Info3}
  }
  [Construction]:MRL{
    [Construction1]:MRL{URL1+Info1,URL2+Info2,
                        URL3+Info3}
    [Construction2]:MRL{URL1+Info1,URL2+Info2,
                        URL3+Info3}
  }
} information of image range;
```

In the geographic information server including geographic information server search unit, image data with the above-mentioned structure can be sent to a client as a result of search of the geographic information server. In this case, the range of index information of a geographic information server may be imaged as a border line and selected. Thus, the MRL corresponding to the selected part can be accessed. Usually, one of search conditions in the range which is displayed for clients is searched. However, in the case of searching with a wider region including the above range, the MRL of the result of search may be within the object of the whole image data to be sent.

It is preferred that since an operator involuntarily uses browsing of the search and map, the next function is expanded.

When an operator demands information of an area which cannot be imaged to a geographic information server which had already been accessed, the geographic information server automatically obtain the search result from a geographic information server search unit used and can have access to a new server group again in accordance with the search result. Consequently, if an operator once sets a search condition, the operator can automatically have access to appropriate geographic information without the intention of performing any search when the display area is transferred and its enlargement and reduction are performed.

FIG. 4 shows a hierarchical tree structure of the geographic information servers and geographic information search servers. A geographic information search server also can search other geographic information search server. And these geographic information search servers can be linked to each other. Thus, it is not necessary for one geographic information search server to have index information of all of geographic information servers. For example, the geographic information search server can constitute geographic information servers from a geographic information server with a wide area geographic information to a geographic information server with narrow area geographic information. That is, when the display area is enlarged, a server with further detailed data can be searched in accordance with the specific place and desired scale.

As described above, since the present invention has geographic information search servers which generate a combination list of a plurality of geographic information servers and displays geographic information obtained from the plurality of geographic information servers while superimposing the information, various geographic information which cannot be provided by one geographic information server can be provided from a plurality of geographic information servers on the network.

Further, in the present invention, since the geographic information server converts geographic information to image data of a standard graphics data format and sends the data, a client can easily display a plurality of image data at the image level while superimposing it.

Further, the function of conversion can be relatively easily provided as a middleware of an existing geographic information server, and a plurality of geographic information server groups with different specifications from each other can be used as geographic information servers with the same specifications.

Additionally, since the geographic information server also includes the geographic information server search unit, the geographic information server group can be hierarchically formed, whereby a more user friendly internet application can be provided.

Many widely different embodiments of the present invention may be constructed without departing from the spirit and scope of the present invention. It should be understood that the present invention is not limited to the specific embodiments described in the specification, except as defined in the appended claims.

What is claimed is:

1. A map display system including a plurality of geographical servers, a search server and a client;

a geographical server of said plurality of geographical servers includes a first database for storing geographical information, and a first control means for searching the geographical information by using the first database, converting the searched geographical information into graphics data with a standard format and with same coordinates and sending the converted graphics data to the client,

said search server including a second database for storing index information of the graphics data provided from each of the plurality of geographical servers, and a second control means for generating a combination list which contains location information with respect to locations of the geographical servers and sending the combination list to the client, and

said client including a search server access means for obtaining the combination list, a geographical server access means for obtaining the graphics data from the geographical servers designated by the obtained combination list, and a display means for displaying a map on a screen so that the obtained graphics data are superimposed with each other on the same screen.

2. A map display system according to claim **1**, wherein the index information include region parameters for defining a region within which the graphics data are to be displayed and function parameters for specific functions provided from each of the geographical servers.

3. A map display system according to claim **2**, wherein the region parameters includes items of a region name, a display region, a contents of display and maximum/minimum scales, of the geographical information.

4. A map display system according to claim **2**, wherein the combination list further includes the index information of the graphics data provided from the geographical servers designated by the location information.

5. A map display system according to claim **1**, wherein the first control means generates the graphics data based upon parameters commanded by the client.

6. A map display system according to claim **1**, wherein the first control means sends available parameters to the client before the client access to the geographical server by the geographical server access means.

7. A map display system according to claim **1**, wherein the client further including store means for storing the index information.

8. A map display system according to claim **1**, wherein the search server access means accesses to the search server in order to obtain the combination list again when a map outside the region of the index information is commanded.

9. A map display system according to claim **1**, wherein the geographical server further includes the second database and the second control means.

10. A map display system according to claim **9**, wherein the geographical server further includes the geographical server access means.

* * * * *